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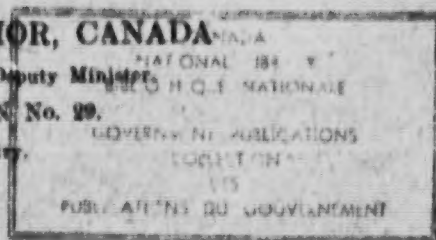
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DEPARTMENT OF THE INTERIOR, CANADA

Hon. ROBERT ROBERTS, Minister; W. W. COVEY, Deputy Minister

FORESTRY BRANCH—BULLETIN No. 29.

R. H. CAMPBELL, Director of Forestry.



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REPORT ON TIMBER CONDITIONS AROUND
LESSER SLAVE LAKE

BY

D. ROY CAMERON, B.A., B.Sc.F.

OTTAWA
GOVERNMENT PRINTING BUREAU
1912

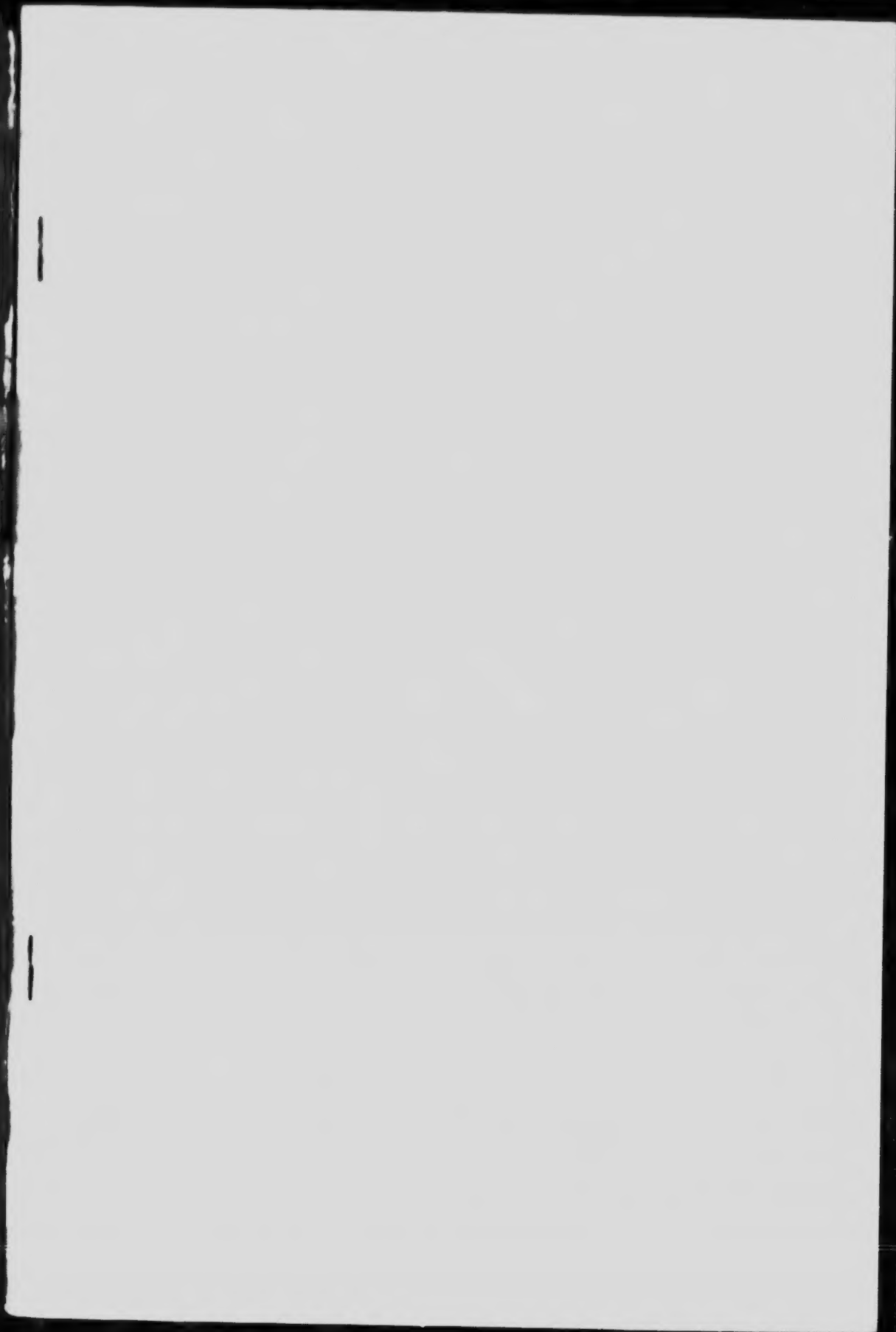




FIGURE 1.—Lodgepole Pine; Skagway Type. (Headwaters of Salmon River.)

Photo by R. G. Fennell, 1961.

DEPARTMENT OF THE INTERIOR, CANADA

Hon. ROBERT BORDEN, Minister, W. W. CORY, Deputv Minister.

FORESTRY BRANCH—BULLETIN No. 20

H. H. CAMERON, Director of Forestry.

REPORT ON TIMBER CONDITIONS AROUND
LESSER SLAVE LAKE

BY

D. ROY CAMERON, B.A., B.Sc.F.

OTTAWA

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LETTER OF TRANSMITTAL

FORESTRY BRANCH,

DEPARTMENT OF THE INTERIOR,

OTTAWA, March 20, 1912.

SIR,—I have the honour to present herewith a report by MR. D. ROY CAMERON, B.A., B.Sc.F., on the 'Timber Conditions Around Lesser Slave Lake,' and to recommend its publication as Bulletin No. 29 of this Branch.

The information contained in this report was obtained by the author as chief of a party which made a reconnaissance survey of the district in the summer of 1911.

The report outlines the work of the party throughout the summer, and proceeds to give a survey of the general conditions of the district under the headings of topography, soil, climate, forest growth, damage to the forest growth by fires, and, finally, the manner and extent to which the forest is being reproduced or renewed.

The country examined is then taken up by districts, ten in number.

The importance of reserving designated portions of the territory, the soils of which cannot profitably be used for agriculture, is urged, not only for the beneficial effect on the navigation of the rivers and for the prevention of erosion of the land, but also in order to render available a timber supply when the country is settled, as it must be in no very long time.

A scheme of fire protection, illustrated by a map, is also submitted.

A number of tables, summarizing important information about the country, are given as appendices.

I have the honour to be, Sir,

Your obedient servant,

R. H. CAMPBELL,

Director of Forestry.

W. W. CONY, Esq., C.M.G.,

Deputy Minister of the Interior,

Ottawa.

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REPORT

ON

TIMBER CONDITIONS AROUND LESSER SLAVE LAKE.

The ever swelling tide of immigration into the Peace River country and vicinity renders it imperative that steps be taken to set aside non-agricultural lands in order that the timber resources of that country may be conserved for the need of future generations.

It is evident that the settler, from his position in the community, cannot be expected to realize that the value of a perpetual timber supply is more important than the facility in clearing land afforded by the unchecked use of fires. There is also a feeling among many that fires are beneficial rather than otherwise, inasmuch as they turn poplar and willow country into prairie. The possibility of the destruction of large areas of valuable timber is regarded as a chance to be taken if the desired end is to be secured. Moreover, the persistence of the old, ignorant belief that the north country contains an inexhaustible timber supply accounts for a great deal of carelessness.

Experience has taught that the only way to obtain efficient fire protection is to have all the non-agricultural lands put into forest reserves. The best time to do this is before settlement has encroached on poor land, because in this way the difficulties and friction of dealing with settlers is dispensed with. With this object in view it was decided, last winter, to send out a party to examine the country in the neighbourhood of Lesser Slave Lake, much of which was known to be rough, hilly, forest land.

RESUMÉ OF THE SEASON'S WORK.

Pursuant to instructions of March 24 and April 7 last, I proceeded to Edmonton, arriving there May 17. There I met Mr. J. A. Doucet who had preceded me for the purpose of securing supplies and having them forwarded by team to Athabaska Landing. I found that with the exception of a few odds and ends everything was in readiness.

On May 25, Messrs. R. G. Lewis and F. McVickar reported to me. The next day we proceeded to Athabaska Landing, and on May 31 left by steamer for the mouth of the Lesser Slave River. Here we began field-work.

My instructions were to take the rivers as bases and run strips at intervals from them. This method is practicable only in a flat country where there are numerous lakes and streams, where it is possible to travel by canoe in any direction. Unfortunately, along the Lesser Slave River tributaries are few, and generally impassable after a few miles, so that only a narrow strip four to eight miles wide along the main river could be examined by this method. Consequently, I found it necessary to supplement this work by sending out parties of two across the muskegs. These parties packed their supplies on their backs.

On arriving at Sawridge I learned that there were many hunting and pack-trails leading back into the hills. I therefore considered it advisable to buy some pack-horses. This allowed us to explore country that would otherwise have been inaccessible.

From Sawridge we worked along the north shore of the lake as far as The Narrows. The season was very rainy and the trails, therefore, in very poor shape. It was found necessary to leave the main camp in charge of the cook at the lake shore and do the work by sub-camps. Sub-camp parties of two would take two horses and a few days' food, and work their way back into the hills as far as possible.

Continued rains hampered the work very much, and made travelling through the thick brush very disagreeable. It was the middle of August before The Narrows were reached. Inasmuch as the country along the north shore west of The Narrows is largely muskeg, I considered it best to return to Sawridge and start work in the Swan Hills before the season should become too late. Sub-parties ascended all the creeks flowing into the lake from the Swan Hills, one crossing to the head-waters of the Saulteaux river. The south shore at The Narrows was reached by September 10. F. McVickar returned from here to college. Several side-trips from the Swan River settlement, and a week's bad weather, prevented our starting for the Swan Hills proper until September 25. These delays rendered it impossible for me to take Lewis into the hills. He therefore returned to college at this time.

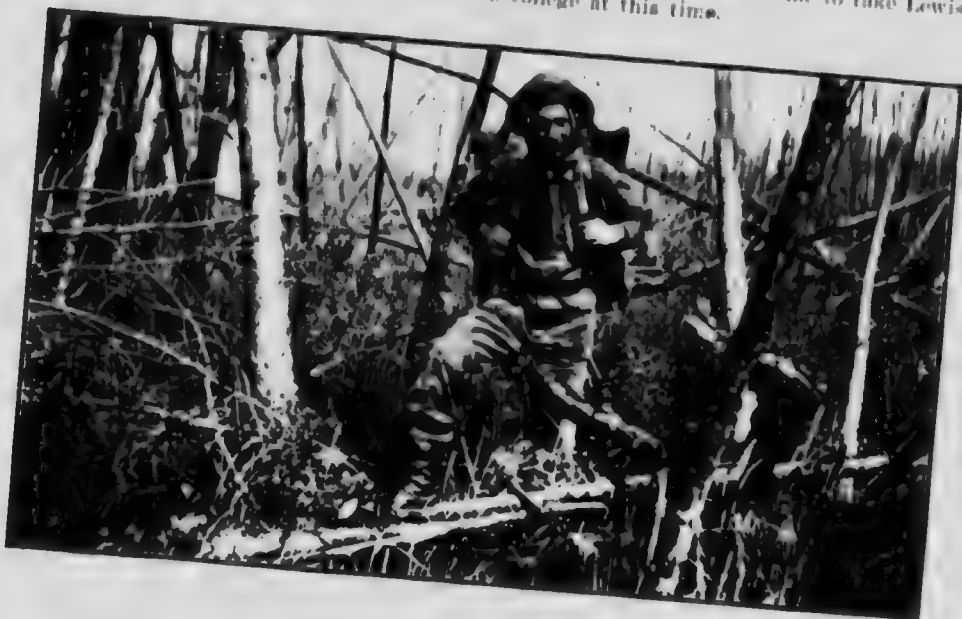


PLATE 2. — Packing across Muskeg Brook.

Photo D. Roy Cameron, 1911.

The supplies and baggage were hauled by wagon up the Swan River to its junction with the overland trail to the Klondyke twenty five miles above the settlement. The main camp was set up there. From this point three long side-trips were made; one east along the 18th base line to the head waters of the Saulteaux to connect up with former work; one south along the Klondyke trail to Deep creek, thirty miles from Ft. Assiniboine; and one up toward the head-waters of the Swan river to Freeman lake, across the hills.

The lateness of the season, lack of horse-feed and coming of snow necessitated our return to the lake when these trips were completed. Two short trips to complete timber examinations near the settlement closed the work for the summer. The pack-horses were disposed of at the settlement, and on October 25 the start was made from Wappa on our return trip. We travelled down the Athabaska river by canoe among floating ice cakes. Athabaska Landing was reached just three days before the final freeze-up.

GENERAL CONDITIONS.

TOPOGRAPHY.

The Athabaska river from Athabaska Crossing flows easterly to Ft. Assiniboine. Here it turns and runs north seventy miles to Mirror Landing at the mouth of the Lesser Slave river. Thence it flows easterly again twenty miles before making the big bend down to Athabaska Landing. The country lying to the north and west of this part of the river is that examined last season.



Photo. F. McVickar, 1911.

PLATE 3.—Packing.

The Athabaska river flows between banks 100 to 600 feet high, covered on their slopes with poplar or spruce. Behind, on the general level of the country, are large areas of muskeg stretching to the interior hill country or to the watersheds of other water systems. These muskegs are largely burnt.

The Lesser Slave river lies in a valley eight to ten miles wide consisting of flat burnt muskeg country with interspersed gravel or boulder-clay ridges.

Lesser Slave lake, notwithstanding its area, is very shallow. The north shore is even, composed of stones. Back from the lake on the northeast corner is Martin mountain, which in reality is a plateau, 1,000 feet above the lake at its highest point. This elevation stretches easterly to Moose lake by lower ridges. This plateau is composed of a very thick blanket of the omnipresent boulder-clay, underlain by shales of Cretaceous origin. The country-rock, however, is never exposed. West of Martin mountain the country is lower, flattening down to muskeg west of the narrows of the lake. Long, low gravel or sand ridges form islands in the general muskeg.

South of Lesser Slave Lake, as far as the eye can see back from it, is another high plateau country known as the Martin plateau. This plateau averages 500 to 1,000 feet higher than Martin mountain. The country is broken by deep valleys. The northern edge is well defined, and is marked by the presence of numerous spur-

ridges running north to the shore of the lake. Between these ridges are numerous creeks which have their origin in the plateau.

The Swan River valley is the most conspicuous break in the hills. It penetrates deep into the heart of the plateau. West of The Narrows the high land retreats back from the lake, leaving large areas of agricultural land.

The southern edge of the plateau is not so distinct. The high land descends by large steps or benches. Both the summits proper and these terraces are flat areas, comprising muskeg interspersed with gravel or boulder-clay ridges. This gradually changes to rolling country to the southeast, until agricultural land is found at Deep Creek. More to the west, however, south of the upper waters of the Freeman river is another high plateau reaching to the Athabaska river.

SOIL.

Agricultural land occurs in patches increasing in size to the west. North of the Athabaska river, east of Mirror Landing, is an area of poplar country interspersed with muskeg. Of the 100 square miles included here, approximately 75 can be farmed.

A narrow strip along the Lesser Slave river from Muskeg creek to Mirror landing, perhaps fifteen square miles in all, is suitable for agriculture. Back of this on either side of the river is muskeg.

A low spur-ridge, one of the eastern extensions of Martin mountain, contains some twenty five square miles of poplar country which is good land. This is situated in the northwest quarter of township 73, range 2, west of the 5th meridian, and the north half of township 73, range 3, west of the 5th meridian.¹ There are some nine square miles of hay meadows and prairie at the eastern end of Lesser Slave lake adjacent to Sawridge. This is very valuable land.

South of Martin mountain, between Muskeg creek and Martin creek, is a tract of poplar or spruce country about forty five square miles in all, which is capable of being farmed when the prairie land is all taken up. West of this there is little agricultural land on the north side of the lake until the western end is reached.

South of the lake, east of The Narrows, the foot-hills of the Swan Hills plateau extend almost to the water's edge, so that with the exception of some ten square miles in the north half of Township 72, Range 6, west of the 5th Dominion meridian, and a few quarter-sections at the mouths of creeks, there is no agricultural land east of the Swan river valley.

Along the Swan river, for about half a mile to one and a half miles on either side, is prairie or semi-prairie. There are some twenty-five square miles of this. The Swan River settlement is situated here. The land is alluvial soil of the richest kind.

West of the Swan river, north of the Swan hills a large area of country covered with a dense growth of poplar, birch, willow and aspen, most of which when cleared will be good land. Between Swan river and the west end of the lake there are perhaps 300 square miles of this country. However, there is little likelihood of this land being settled until the prairies further west have been filled.

In general it may be said that the soil of the potentially agricultural regions is a loam, either clay or sandy. This is underlain everywhere by boulder-clay. Sand ridges occur in spots. They are evidenced by the appearance of jack pine.

¹ The expressions 'west of the 5th meridian' and 'west of the 5th Dominion meridian,' often used in the bulletin, refer to the meridians used as reference lines in the Dominion surveys. The 5th Dominion meridian coincides almost exactly with the 114th meridian of longitude west of Greenwich. This expression is frequently abbreviated: for instance, Section 5, Township 6, Range 10, west of the 5th meridian, becomes Sec. 5, Tp. 6, Rg. 10, W5M, or even 5-6-10-5.

The country is laid off, in checker-board fashion, in townships, each six miles square. The north and south rows of these are known as ranges, while the east and west row is designated as e.g.: Township 60, (or occasionally as Township 'Tier'). Townships are numbered from the International boundary (Latitude 49 degrees) northward, while the ranges are numbered westward from the meridian next east.

The great areas of non-agricultural land are divisible into two classes, viz., (1) undrained, and (2) broken.

The undrained areas are muskeg underlain by boulder-clay which appears above the general level as ridges.

In the broken hill country we have a different condition, especially along the north face, or 'shield,' of the Swan hills. Here is a large area much broken by cross-ridges and deep ravines, but covered to a considerable depth with a top layer of fine clay loam mixed with stones. Owing to the latter, and to the rough nature of the country, this region is unsuitable for agriculture, but it is one of the best locations for timber growth that could be found. Indeed, it was once covered with the finest stand of spruce and lodgepole pine in the north country.

The subsoil here is boulder-clay. In less favoured regions in the interior, and on the southern side, the boulder clay reaches the surface.

CLIMATE.

The climate of this country has been a subject of much controversy. Some claim for it all the possibilities of the wheat belt to the south, others say that it is impossible to grow anything. In the appendix are given results of observations taken from June 3, when the work of the party commenced, until September 21. After the latter date the party moved into the Swan hills. Later than this, variations in elevations, &c., need so many corrections that the data are of little use. Frosts occurred nearly every night in the Swan hills and snow fell frequently. Frosts recorded in July seem to have been of local occurrence. The party was then located in the neighbourhood of Muskeg creek on the north shore of the lake at the east end of Martin Mountain. Different inquiries at Swan River settlement seem to confirm the statement that no frost occurred there in July.

As regards crops, I do not think wheat will do well around the lake except, possibly, at the west end. Last summer, even the oats were badly frozen in the Swan river valley, although they are said to do well most years.

There is a great future for the country in hay crops and stock raising.

FOREST GROWTH.

The forest areas of the lands examined may be divided in a general way into eight classes:—

1. Muskeg.
2. Poplar.
3. Cottonwood Flats.
4. Jack Pine.
5. Lodgepole Pine.
6. Summit-Plateau.
7. Height-of-Land.
8. Spruce.

MUSKEG.

This type is omnipresent. It develops in three ways, viz.:

1. Marginal areas to river systems, as in the case of the Lesser Slave and the Saulteaux rivers, where the muskeg extends back from the shores for a distance of from three to five miles.
2. Undrained height-of-land areas. Here muskeg occurs surrounding numerous gravel or boulder-clay ridges or islets.
3. On summit of plateau. Here the muskeg is associated with areas of lodgepole pine, black spruce and fir. Muskeg up here is very wet, either it is composed almost entirely of very scattered tamarack, or is bare open tundra of moss or reedy grasses.

In general the muskeg of this country is not so wet as that encountered in the summer of 1910 along the line of the Hudson Bay railway. This is evidenced by the fact that black spruce predominates upon the area instead of tamarack. The spruce is, however, so small in size that the amount of pulpwood which could be cut to four inches diameter is negligible.

There are altogether some 2,000 square miles of muskeg in the 6,700 square miles of country examined, or approximately 30 per cent of the whole. This includes the percentage of muskeg in the height-of-land, summit-plateau and other types.

POPULAR TYPE.

The poplar type covers an area of some 923,000 acres altogether, located as follows:

Athabaska river valley.	60,000 acres
Martin mountain country.	194,000 "
Narrows creeks.	102,000 "
North slopes.	300,000 "
Ottawa River country.	15,000 "
Upper Sauleux.	132,000 "
Lower Freeman.	60,000 "

This type is generally a mixture of many species, but aspen predominates.

The species on an average will run in mixture as follows: -

Aspen, 80 per cent; balsam poplar, 15 per cent; birch, 4 per cent; spruce, 1 per cent. In some localities jack or lodgepole pine also occurs in the mixture.

The aspen in this country as elsewhere is very susceptible to the attacks of the heart-rot (*Polyporus squaratus*). Studies showed that approximately forty three per cent of the total stand is so defective as to be useless. Of the remainder, only twenty per cent is entirely sound, eighty per cent being more or less discoloured, although the fibre of the wood has not as yet been destroyed.

The average yield in pulpwood to four inches diameter over this area is approximately twenty cords per acre of aspen and balsam poplar. The other species may be neglected. At this estimate we have, of really sound aspen, 3.2 cords per acre; of discoloured wood, 12.8 cords per acre; the total available is thus 16 cords per acre.

The balsam poplar is also subject to grave defects, 50 per cent being useless through frost-crack and other causes. There will remain about four cords of material of pulpwood size per acre. Therefore, there are found of absolutely sound wood per acre:

Aspen.	3.2 cords
Balsam poplar	4.0 "
	7.2 "
Of discoloured wood.	12.8 "

Figuring at this estimate over the whole area we have, of perfectly sound wood at 7.2 cords, 6,750,000 cords. Adding defective, but not destroyed, wood at 12.8 cords per acre, 11,810,000 cords; total, 18,560,000 cords. Aspen in the poplar type grows at an average rate of one inch in nine years. The average age is 72 years, and the average diameter at breast-height, 8 inches.* Balsam poplar in the poplar-type country has about the same rate of growth.

*Breast-height, a term frequently used in this bulletin and in forestry literature generally, is understood to be four and a half (4½) feet above the ground. For the sake of uniformity and to afford a basis for accurate comparison, measurements of the diameter of trees are invariably taken at this height for forestry purposes. 'This point is above the root-swellings and is the natural place to caliper a standing tree.' (H. S. Gracia, *Forest Mensuration*.) The expression 'diameter at breast-height' is frequently abbreviated, especially in tables, to D.B.H.

Considering the poplar type as a whole, one may state that it is in general a temporary type, the result of fire. At one time or another, most of this area was covered with spruce, and is capable of being reforested with that species under proper management. This is evidenced by the fact that, whenever conditions are at all suitable, spruce reproduction appears, even though the spruce seed-trees in mixture compose only one per cent or less of the stand. Many localities where the humus cover is too deep to allow spruce seeds to germinate show reproduction of balsam fir. This would undoubtedly, in the climax type, be largely replaced by spruce.

Along the alluvial benches of the stream flowing into Lesser Slave Lake from the south, the conditions of growth of balsam poplar (or balsam) are altogether different.

COTTONWOOD FLATS.

Along the Swan river, for instance, so-called 'cottonwood' flats are found where this species grows intermixed with some spruce. Here we find trees growing 100 feet high with 65 feet clear and a diameter at breast-height of from 15 to 80 inches. The average will be about 24 inches. The older and larger trees are mostly defective from heart-rot, but the younger up to 2 inches in diameter are sound and beautiful timber.



Photo D. Roy Cameron, 1911.
PLATE 4.—Cottonwoods along Nine Mile Creek.

These patches are, however, very limited in area, and are generally confined to a strip one to three chains wide along the river or in narrow flats of one to five acres, formed by the sinuosities of the rivers. This tree in such locations has the fastest growth of any in the north country. Rings are often seen over half an inch wide.

On the average it will grow, for the first fifty years at least, at the rate of an inch every four years. Height-growth will average ninety feet for the stand.

BIRCH TYPE

The birch type is very localized, being confined to small areas around the mouth of Nine-mile creek and in the Assiniboia River valley. The area is really negligible, but is interesting as showing development in pure stands of the northern canoe birch (*Betula resinifera*). This tree is small and spindly, and, except in exceptional cases, does not attain a diameter of more than six inches. It is susceptible to attacks of Polyporus fungi, and, when dead, disintegrates very rapidly.

JACK PINE TYPE

The jack pine shows development in pure stands wherever sand is found. Along the Athabaska and Lesser Slave rivers it grows freely; generally, however, the stands are as yet young, the average age being fifty to fifty-five years and the average diameter eight inches. A remnant of an older stand is to be found around Mirror landing. Here are trees up to 24 inches in diameter at breast-height. They are, however, short and very limbs. Growth around Mirror landing is rapid, probably averaging an inch in diameter every four or five years. This is, however, exceptional, and the average growth will not be greater than an inch in six years.

LODGEPOLE PINE TYPE

This type covers the largest area of any in the country examined. It is the characteristic type of the valley slopes of the Swan hills, to which it is practically confined. There are, roughly, some 1,000 square miles of this type.

In the timber, lodgepole pine predominates, with a large admixture of black spruce wherever a flat bench occurs. Such benches—really small muskegs—cover twenty per cent of the area. It seems that the lower the elevation the pine can obtain, the better it will grow. In creek gulches and on the outer edges of the benches, it attains the size, and has a rate of growth of approximately one inch every seven years. Such locations are, however, scattered, and on over 95 per cent of the area the pine will never make the size. The growth on this latter area is the typical Rocky Mountain timber-line development—dense, spindly growth one to six inches in diameter at breast-height (4½ feet from the ground), and twenty to forty feet high. On such locations this type is useful principally as a protective covering and as a possible pulpwood supply for the future.

On the better locations stands occur which will cut, on an average, twenty-five ties to the acre. No definite areas for this can be given, but, figuring on a basis of five per cent of the total area we have 95 square miles, or 60,000 acres, which gives roughly some 1,500,000 ties. There will be, easily, this amount on the area, but the patches are so scattered as to make it doubtful if it can be used for some time yet, at any rate. On the remaining 95 per cent of the area, comprising some 1,196,000 acres, there can be found at present five cords of pulp per acre of pine and spruce—5,980,000 cords in all. Inasmuch as a great deal of this timber is a young growing stand it may be considered certain that in twenty years time the yield will increase 100 per cent. Thus, by the time this timber is needed for pulp there should be a supply of at least 11,000,000 cords, if fire is kept out.

Trees examined on an optimum site showed an average height of 75 feet and a diameter of from 4 to 13 inches.

SUMMIT-PLATEAU TYPE

This type is confined to the flat tops of the Martin mountain and Swan Hills plateaux. It covers an area of some 1,300 square miles, of which almost four per cent—square miles, is on Martin mountain.

This type is an admixture of lodgepole pine, balsam fir and black spruce in varying proportions according to local conditions.

The composition is different on Martin mountain to that seen on the Swan hills. On the former plateau, the average stand is approximately:

Balsam Fir	50 per cent
Lodgepole Pine	40 per cent
Black Spruce	10 per cent

Growth is very slow, the trees are stunted (pole size only) four to eight inches in diameter, with occasional ones in better sites up to fourteen inches.

On Martin mountain this growth will run ten cords of pulpwood per acre per annum 12,000 cords in all.



Photo D. Roy Cameron, 1911

PLATE 1. Summit of Swan Hills. Type: Summit of Swan Hills. (Tp. 66, R. 11, W. 5M.)

On the Swan Hills summits, which are 500 to 1,000 feet higher than Martin mountain, the species are generally more clearly separated, the pine preferring boulder clay ridges and the thick spruce the muskegs. The percentage of balsam fir is also different, being only 10 per cent, as compared with 50 per cent for Martin mountain. A tendency is also to open tundra areas between the ridges in the Swan Hills summits. Fifty per cent of the area on these hills is muskeg. Nowhere on the Swan Hills will the timber of this species be of use for anything more than a protective covering. But it has an important function in this regard.

HERBICEOUS-LAND TYPE.

This type is divisible into two parts according to which species of pine grows upon it.

The first type occurs north of Lacar Lake river and lake. This is really the head waters country forming the divide between the Lacar Lake and Washoe water systems. It appears on the lake shore west of Martin creek. Elsewhere it is far in the interior. In all, there are about 675 square miles of the country within the tract examined last season. The timber of this type is mostly pole size or under. The country consists of an alternation of muskeg and ridges of sandstone, or, rather, islands in a sea of muskeg. The ridges contain open stands of limby pole jack pine or the muskegs bear stunted tamarack and black spruce. About sixty per cent of the area is muskeg. Fifty per cent of the country has been burnt within the last thirty years.

South of the Swan hills, in the region lying between the head waters of the Southern river and Deep creek is another tract of head-of-land country. Here are found the same characteristic topographic features, of ridges surrounded by muskeg. The only thing to differentiate the country from that lying north of the lake is the fact that the lodgepole pine replaces the jack pine on the ridges.

The lodgepole pine grows in dense stands, the trees are small and spindly, rarely over four inches in diameter at breast-height and forty feet high. Towards the southern boundary of this type, occasional large ridges occur, showing a mixture of aspen and spruce on their northern slopes.

SERIES TYPE

This type is taken to comprise those areas where commercial spruce is found as the predominant tree. It is at present confined to small scattered patches, remnants of stands which formerly covered much larger areas.

Two main variations of this type occur, namely, spruce-poplar, and spruce-cottonwood.

The spruce-poplar type consists of white spruce with an admixture of aspen and balsam poplar. It occurs mainly on well-drained uplands or slopes. The run of the timber varies as to proportion of spruce to poplar. The spruce is generally limby, not averaging one log clear. The average height varies from 85 to 105 feet, according to the site. The diameters run up to forty-eight inches, but the average will be about fourteen inches. In this type is found the best development of aspen poplar. Specimens were found in this type two feet in diameter and 100 feet high, with 75 feet clear. Trees of this size, however, are always very defective from heart-rot (*Polyporus imbricatus*).

The spruce-cottonwood type occurs principally on lower levels, on overflow lands, in creek valleys, or occasionally on the lower slopes of hills. In these last localities there is generally a transition to the spruce-poplar type. The timber is generally large in the spruce-cottonwood type, but the stand is more open and the trees more limby. Sample areas taken showed timber running over 80,000 feet per acre. The height-growth of spruce will average higher than in the spruce-poplar type as will also the diameters.

In this type we have cottonwood occurring in transition to pure cottonwood stands as dealt with above. Trees of this species occur frequently overtopping the spruce, with a height-growth of 110 feet. In general, however, the percentage of defect is great.

These spruce types are remnants of a former forest. Both show a majority of the trees mature or over-mature. Depreciation in value is occurring every year, so that a thinning out is urgently needed. If this were done younger suppressed growth would be given a chance.

FIRES.

Of the total area of land examined last season, 14 per cent, or 900 square miles, has been fire-swept within the last twenty-five years. Of this area 85 per cent is either muskeg country or a type containing a large percentage of muskeg. The

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Photo by Ben Cameron, 1911

PLATE 6. Big Birds at Head water of American River

exception is the burned-over area south of Lesser Slave lake in the northern foothills of the Swan hills. This fire burnt mostly spruce and poplar.

As a general rule it may be stated that the poplar country has either escaped or resisted fire almost entirely. This is no doubt due to the fact that the duff and humus accumulations are less inflammable than those forming the litter of a coniferous forest.

The prevalence of fire in the muskeg is probably an exception to the general rule. This is due to two main factors. In the case of pure muskeg such as occurs in the Lesser Slave River valley it is the result of successive fires occurring with such frequency that finally all has been burned. In the case of country which is only partly muskeg, the susceptibility to fire may be accounted for by the presence of numerous small ridges of jack pine and lodgepole pine, which serve as points for the concentration and subsequent diffusion of the flames.

The areas burnt are divisible into five parts:

1. Lesser Slave River valley.
2. East of Martin mountain.
3. Narrows creek.
4. Northern shield of Swan hills.
5. Miscellaneous small fires.

THE LESSER SLAVE RIVER VALLEY.

The Lesser Slave River valley is the long established route to the Peace river country. Hence it has suffered, naturally, from successive fires for a great many years. At the present time it is practically destitute of green timber of any kind. Fortunately for the surrounding hill country, the Lesser Slave river flows through the centre of a vast muskeg, which stretches on either side three to five miles, so that fires have not been able to penetrate far into the hills.

Within the last twenty-five years fires have burnt an area of over 300 square miles in this district, but not much merchantable timber has been destroyed.

COUNTRY EAST OF MARTIN MOUNTAIN.

This region includes the district forming the head-waters of the Driftpile river, and the country lying north of Moose lake towards the foothills of Pelican mountain. These areas are similar in character, and have been burnt at approximately the same time.

They are, however, separated by a green tract five to ten miles wide. Both belong to the height-of-land type explained above; therefore, no very valuable timber has been destroyed. The principal effect of fire here is its detrimental effect on water-flow. The head-waters country of the Driftpile river has an area of approximately 110 square miles burnt. The burn lying north of Moose lake covers some 120 square miles.

NARROWS CREEK.

The country lying north of The Narrows comprises, first, a low range of poplar hills, and then a large area of flat muskeg country. The latter is practically all burnt, the only exception being places where the ground was too wet for fire to run. Some ninety square miles were mapped in as being burnt here, and undoubtedly a much larger area to the north, which is of the same type, has also been fire-swept. No valuable timber was destroyed here.

NORTHERN SHIELD OF SWAN HILLS.

Fifteen years ago settlers clearing land in the Swan River valley started a fire which swept eastward over fifty miles, with varying widths of from two to six miles. Again two years ago a fire starting at practically the same spot swept the same area, destroying the remnants left of the former stand, and the reproduction which had just gained a foothold. The country thus ravaged comprises that region spoken of before as the northern face, or 'shield,' of the Swan Hills. It was covered formerly with a magnificent stand of spruce and lodgepole pine. Now it is a blackened ruin, treeless and in many cases soilless, a monument of man's recklessness.



Photo D. Roy Cameron, 1911.

PLATE 7. - Big Brulé, Swan Creek Valley.

In this region I have estimated that some 140 square miles of country have been fire-swept. Of this, an area of some 110 square miles, or 70,000 acres approximately, were spruce. Remnants left average from ten to twenty-five thousand feet, board measure, per acre. Putting the average run over this area as five thousand feet, board measure, per acre, 350,000,000 feet of merchantable timber must have been destroyed. These two fires have destroyed enough timber to supply the needs of a large community for a great many years.

The head-waters of the Ottauwau show another fire slightly older. This occurred some twenty-five years ago. It burnt about forty-five square miles of lodgepole pine, jack pine, black spruce and poplar.

Several areas have been burnt along the Klondyke trail. The largest is along Deep creek where ten square miles along the creek were burned over about fifteen years ago. A burn of about the same size was noted near the head-waters of the Swan river. This is conspicuous because it is the only burn in a very large area of country.

In the Martin mountain district there is a new burn in the summit-plateau type, covering some seven square miles, and another east of Divide lake around the head-waters of the east branch of Martin creek, which has burnt over about six square miles.

REPRODUCTION.

The burned areas in general show little sign of good reproduction. This is due to the fact that most of the fires have occurred within the last few years. It is a well-known fact that muskeg areas are a long time in restocking. As most of the country burnt is of this type it may be expected that the new growth will be slow in coming. At present these areas are for the most part destitute of reproduction of any kind.

The spruce tract south of the lake which was burnt fifteen years ago had restocked well, but the second fire has exterminated the second growth and totally destroyed the

soil, so that it is doubtful if another growth can secure a footing for many years. The outlook for another spruce crop at any rate is very poor.

The burn in the Ottauwan head-waters country is practically the only one where the forest cover is complete and a new crop well started. In that district there is a thrifty young growth of lodgepole pine, jack pine and poplar.

Along the Klondyke trail near Deep creek good reproduction of lodgepole pine is seen, and in the burn in township 65, ranges 6 and 7, west of the 5th Dominion meridian.

The spruce remnants are interesting as showing the natural course of reproduction of the climax types where fire has not disturbed the rotation. In such localities we find that the reproduction under the spruce itself is 90 per cent balsam fir. This is due to two factors; first, to the fact that the fir seeds will germinate and obtain nourishment on ground so covered with litter that the mineral soil is nowhere exposed, whereas the spruce will not, and, second, to the greater tolerancy of the fir. The relation of these factors to the conditions found is evidenced by the fact that where localities are encountered where wind-throw has occurred, in the resulting second growth spruce predominates. Here the sun has had a chance to effect the decomposition of most of the litter and to provide light—conditions suitable for the growth of spruce.

REPORT ON COUNTRY EXAMINED BY DISTRICTS.

MOOSE LAKE.

This district is taken as being bounded on the north and east by the limit of survey, on the south by the Athabaska river, and on the west by a line drawn from the west end of Moose lake to Mirror landing. Moose lake divides this district into two parts, northern and southern.

SOUTHERN.

The southern section is generally gently rolling agricultural land interspersed with scattered sloughs and small muskeg; 50 per cent of this country has been burnt within the last ten years. Timber where left intact is generally poplar, both aspen and balsam poplar, in the proportion of 60 to 40 per cent, with a few scattered large but very limby spruce. Occasional gravelly ridges carry jack pine of pole size. With the exception of a few scattered remnants along the south shore of the lake there is no timber of any consequence between Moose lake and the Athabaska river.

Areas along the lake will total 2.1 million feet. They are situated about one mile back from the lake. They can be taken out via Moose lake and Moose river in high water to Lesser Slave river.

An area of spruce of pole size or better is seen in section 5, township 72, range 26, west of the fourth Dominion meridian. This area is about half a mile square. It contains 16,000 ties and 320,000 feet, board measure, of saw timber. This is a promising young stand, and valuable from its proximity to the Athabaska river, which is only three miles south. In Section 23, Township 73, Range 1, west of the fifth Dominion meridian, is a small patch of spruce about forty acres in area, which will run ten thousand feet, board measure, per acre or 400,000 feet, board measure, in all.

NORTHERN.

There is no agricultural land of any consequence north of Moose lake for many miles. The country consists of numerous ridges of boulder-clay and gravel, with muskegs between. Most of these hammocky ridges are bare from numerous fires. Altogether this land is in very bad condition. If not soon taken care of, reforestation, for a hundred years at least, will be impossible.

This region is composed entirely of the height-of-land type, excepting for a narrow strip of poplar along the north shore of Moose lake. Farther west toward the Driftwood River divide, and extending many miles north, is an unburned area of the same height-of-land type. The Driftwood River watershed is over 50 per cent burnt. The transition from the valley proper to the surrounding general level is very gradual. The valley is wide and very shallow and floored with muskeg and scattered pine ridges.

The height-of-land type surrounds this watershed on three sides, extending to the west to the rougher Martin Mountain country which rises from the general level by low ridges. Only two patches of timber occur in this region, one at the extreme east end of Moose lake and one about two miles northwest from the west end of the lake.

The former area is some two miles long by one quarter of a mile wide. There are, therefore, some 320 acres, which will run five thousand feet, board measure, per acre of small spruce, or 1,600,000 feet board measure, in all. The second area is small, some forty acres only. This runs 10,000 feet, board measure, per acre, or 400,000 feet, board measure, in all. This timber can be easily hauled to Moose lake and driven down Moose river to the Lesser Slave river.

TABULAR STATEMENT OF TIMBER.

Type	Area.	AVERAGE PER ACRE.			TOTALS FOR DISTRICT.		
		Ties.	Cord-wood.	Timber.	Ties.	Pulp-wood.	Timber.
	Acres.	Pieces.	Cords.	Ft. B.M.	Pieces.	Cords.	Ft. B.M.
Poplar.....	60,000		7.2			432,000	
Jack Pine.....	105			20,000			2,100,000
Spruce.....	320	50		1,000	16,000		320,000
	320			5,000			1,600,000
	40			10,000			400,000
	40			10,000			400,000
					16,000	432,000	4,820,000

LESSER SLAVE RIVER VALLEY DISTRICT.

This district is taken to comprise those lands which are bounded on the west by Lesser Slave lake, on the north by the foot-hills of Martin mountain and on the east by a line drawn from the west end of Moose lake to Mirror landing, and on the south by the southern limit of the great valley muskeg, that is to say, the beginnings of the foot-hills of the Swan Hills country.

This whole district is flat, and consists entirely of muskeg except for a narrow strip along the lower Lesser Slave river. In the muskeg are included small ridges of jack pine or poplar, mostly, however, burnt.



Photo F. McVickar, 1911.

PLATE 8.—Sawridge, Alta. (East End of Lesser Slave Lake).

At the east end of Lesser Slave lake there are some nine square miles of valuable meadow or prairie land. This area was once muskeg or willow swales, which repeated fires have transformed into prairie. A couple of patches of merchantable timber occur in this district. There is a ridge about six miles long by half a mile wide, some three miles southwest from Mirror landing, which contains scattered spruce and poplar. There will be altogether about fifteen million feet, board measure, here. This timber can be hauled in winter over the muskeg either to Mirror landing or to the Athabaska river two miles east.

There is also a small patch of tie timber about one mile southwest from Mirror landing. This has only 5,000 ties, but it is so convenient that it is valuable.

Small scattered areas of spruce occur in flats formed by bends of Lesser Slave river along the lower fifteen miles of its course. These will total 100 acres, averaging 10,000 feet, board measure, per acre, or 1,000,000 feet, board measure, in all.

TABULAR STATEMENT OF TIMBER.

Type.	Area.	AVERAGE PER ACRE.			TOTALS FOR DISTRICT.		
		Ties.	Cord-wood.	Timber.	Ties.	Pulp-wood.	Timber.
	Acres.	Pieces.	Cords.	Ft. B.M.	Pieces.	Cords.	Ft. B.M.
Jack Pine.	100	50			5,000		
Spruce.	100			10,000			1,000,000
	750			2,000			1,500,000
					5,000		2,500,000

MARTIN MOUNTAIN.

This natural district is bounded on the north by the northern edge of the high land forming the Martin Mountain elevation, approximately half-way up township tier 77. It is bounded on the east by the Driftwood river valley, on the south by the Lesser Slave River valley, and on the west by a line drawn north from the mouth of Martin creek.

The district includes the Martin Mountain plateau proper and the lower spur-ridges surrounding it. The plateau proper is in the shape of a triangle whose base extends from Martin creek on the west to the west branch of Muskeg creek on the east. The Martin Creek valley forms the west side, and a line northerly from the west branch of Muskeg creek to Divide lake in township 76, range 4, west of the fifth Dominion meridian forms the east side. This country has an average elevation of about 800 to 1,000 feet above Lesser Slave lake. It is broken by steep, deep, creek-valleys, running mostly into Martin creek.

The edge of this plateau country is distinct on three sides, on the north, south and west. On the east it descends more gradually into the height-of-land type of country forming the head-waters of Driftwood river.

Martin creek divides into two branches about fifteen miles from its mouth. Of these, the north branch has its origin in Divide lake, in the northwest corner of township 76, range 4, west of the fifth Dominion meridian. This lake also drains north into the Wabiskaw waters. The south branch drains the northern end of the plateau. Fringing this main elevation are subsidiary ridges, especially on the north and southeast. Those to the north form the north side of the valley of Martin creek, and those to the southeast form the north side of the Lesser Slave river valley. The latter extend from the west branch of Muskeg creek eastward to the Driftwood river.

The agricultural land north of Saulteux landing mentioned before is included in this district. This patch of good land is about eight miles long by three wide. It consists of gently rolling country, covered with poplar from four to fourteen inches in diameter at breast-height, with scattered older spruce. A low ridge near the northern end bears thicker patches of scattered spruce, about one million feet in all. The soil is a rich clay loam, with a few gravelly ridges and scattered sloughs, the latter well adapted for hay meadows, if drained.

This country is much better farm land than that surveyed along the Lesser Slave river, but is, unfortunately, cut off from all access to the government roads and river transportation by five miles of very bad muskeg. To the north of this region of agricultural land is a tract of non-agricultural poplar country stretching from three to five miles farther north. It extends from the west branch of Muskeg creek to the Driftwood river valley. The soil is stony boulder-clay. The poplar is small and badly defective; scattered spruce occurs along creek gulches, &c. No spruce reproduction occurs under the poplar here, largely owing to the depth of humus, which here averages six inches.

Towards the east end of this region, areas of jack and lodgepole pine, mixed with black spruce, occur. There is a transition to the height-of-land type which floors the Driftwood river valley.

The first rise from the lake towards Martin mountain occurs at a distance of about two miles back from the lake. This increases towards the east. There are two to three miles of side-hill, gentle at first and steepening towards the top. This land is non-agricultural, covered with a dense stand of poplar in which are interspersed scattered spruce.

The poplar is in most places a temporary type, but on some of the more gravelly ridges has evidently been established through several rotations. In general, however, with proper treatment, the whole south slope of Martin mountain could be reforested with spruce.

The bench-lands lying between the lake and the mountain slopes from Martin creek to the west branch of Muskeg creek are in general suitable for agriculture. This tract is about fifteen miles long by three miles wide. It is covered with a heavy stand of poplar and scattered spruce. The former are badly diseased from *Polyporus igniarius*, over seventy per cent of the stand being affected. The soil is a clay loam with scattered small muskegs and willow sloughs.

This land will undoubtedly be farmed some day, but it is improbable that it will be settled for many years to come, on account of the heavy clearing necessary.

The northern slopes of the plateau proper which form the south side of Martin creek valley, and all the subsidiary ridges north of Martin creek, are clothed with poplar from four to ten inches in diameter at breast-height, badly diseased. The latter ridges slope on the north gradually down to the height-of-land country forming the head-waters of the Wabiskaw watershed.



Photo D. Roy Cameron, 1911.
PLATE 9.—Jack Pine Ridge. (Tp. 73, Rg. 2, w5M.)

The west branch of Muskeg creek, just above where it enters the muskeg, has about two square miles of prairie. This is so isolated, however, as to be of little value at present. Another patch of semi-prairie is found at the mouth of Martin creek, about one square mile in all. This is a fine situation for a ranger's headquarters.

The summit type of the Martin Mountain country is the summit-plateau type described before. A fire at the head of a small creek flowing into Martin creek has swept over about seven square miles of this type.

The hills between the south fork of Martin creek and Divide lake have been burnt over, an area of about six square miles.

Several areas of good spruce occur in this district. There are two along the lake shore. The first is in or near sections 6 and 7, township 74, range 5, west of the fifth meridian. Here there are about 500 acres which will average twelve thousand feet, board measure, per acre, or 6,000,000 feet, board measure. The timber is generally of small diameter, ten to fifteen inches, but the stand is very thick and the trees tall and clear. This area is only about three quarters of a mile from the lake.

The timber can therefore be easily landed to the shore and rafted from there to any desired point. This timber is mostly growing well yet, and will not deteriorate if allowed to remain untouched.

About twenty acres of poorer pole stuff fronting on the lake have been cut during the past few years to meet local requirements.

Another area is to be found about two and a half miles farther up the lake, on or near sections 23 and 24 of township 74, range 6, west of the fifth Dominion meridian. There are about 800 acres of small timber-size spruce which will cut about eight thousand feet, board measure, per acre; so that there will be approximately 6,400,000 feet, board measure, of spruce in this area.

This timber lies within half a mile of the lake shore and is therefore easily accessible. These two areas should be sufficient to supply the wants of the settlers around Sawridge for a few years. It is important, therefore, that they be conserved from trespass or fire.

In or near section 34, township 73, range 5, west of the fifth Dominion meridian, on the river muskeg is an alder swamp with scattered black spruce, ten to thirteen inches in diameter at breast-height, which will run about one thousand feet, board measure, per acre. There are about 300 acres, or 300,000 feet, board measure, of small timber here. At the border of the muskeg just east of the east branch of Muskeg creek is another area of about two square miles of tamarack and black spruce, which will run to twenty five ties per acre, or about 30,000 in all.

North of Saulteux landing, in or about section 24, township 73, range 2, west of the fifth Dominion meridian, is another tamarack area about a mile long by half a mile wide, which will run 100 ties to the acre, or 32,000 in all.

Three miles north of this area in or near section 33, township 73, range 2, west of the fifth Dominion meridian, is another small area of 100 acres of tamarack and spruce, containing some 5,000 ties or fifty to the acre.

About five miles up Martin creek is a tract of jack pine country covering about ten square miles. This will average twenty five ties to the acre. There will be, therefore, some 100,000 ties here. These can be driven down Martin creek in high water, if the few log-jams in the creek are cleared out.

Bordering this jack pine country on the southwest is a brûlé about ten years old. This covers an area of four square miles. The area burnt was formerly jack pine, with some poplar on the southern side. Reproduction of poplar about ten years and jack pine about four years of age is coming up thickly throughout the burn.

TABULAR STATEMENT OF TIMBER.

Type.	Area.	AVERAGE PER ACRE.			TOTALS FOR DISTRICT.		
		Ties.	Cordwood	Timber.	Ties.	Pulpwood	Timber.
	Acres.	Pieces.	Cords.	Ft. B. M.	Pieces.	Cords.	Ft. B. M.
Poplar	104,000		7.2			13,968,000	
Jack Pine	6,400	25			160,000		360,000
Tamarack and Black Spruce	300			1,000			
	1,280	25			32,000		
	320	100			32,000		
	100	50			5,000		
White Spruce	500			12,000			6,000,000
	800			8,000			6,400,000
Lodgepole Pine, Black Spruce, Balsam Fir	32,000		10			320,000	
					227,000	14,288,000	12,700,000

THE NARROWS.

This district is bounded on the north and west by the limit of survey, on the east by Martin mountain district, and on the south by Lessor Slave lake. Low ridges of boulder clay lie immediately behind the lake and extend back from five to fifteen miles. These ridges run from northeast to southwest. Between them are the branches of two creeks, the East and West Narrows creeks. These drain a large area of height-of-land and muskeg country lying behind the shore ridges.

There is no agricultural land in this district, except for a narrow strip of willow lands one half mile to one mile, and hay meadows along the shore, and about a square mile of hay meadow at the forks of West Narrows creek about five miles from its mouth. The soil of the ridges is gravel or sand. Muskegs, as usual, are underlain by boulder clay, which also appears as ridges in the height-of-land country.

Three main types occur in this district:

1. Poplar.
2. Height-of-land type.
3. Muskeg.

The poplar is confined to the low sandy ridges between the creeks. It is interspersed with men or willow bottoms or small muskegs.

The poplar here has in mixture lodgepole pine and spruce up to eight per cent. The latter species fringe the sloughs and muskegs, but nowhere occur in any quantity. There are about 160 square miles of this country in all.

The height-of-land country is an extension of the Wabiskaw country which, sweeping around the west end of Martin mountain in a belt about four miles wide, reaches the lake shore just west of Martin creek.

The muskeg country lies behind the ridges mentioned before. A narrow burnt strip some three miles wide extends southwest twelve miles down the east branch of West Narrows creek from the main muskeg. Of the main tract, some 100 square miles of the eastern half is burnt. This burn extends far into the north beyond the patch examined.

The western side of this district is bounded by unburnt muskeg, which probably reaches the lake shore about fifteen miles west of the Narrows.

Merchantable timber is very scarce, three small areas comprising the whole in this district. Of these, two are along the lake shore, and the third one, on the ridge between East and West Narrows creek, about five miles back from the lake, is situated near section 20, township 26, range 8, west of the 5th meridian.

The shore areas are to be found about six miles east of The Narrows. They occur as narrow strips along the lake shore, forming a fringe to semi-muskeg behind. There are two small tracts, some 55 acres in all, containing 220,000 feet, board measure, or 4,000 feet, board measure, per acre. This timber is small spruce mixed with tamarack just above tie size. The inland tract in section 20, township 26, range 8, west of the 5th meridian, is also small stuff, but heavier than that along the lake shore. It will run 6,000 feet, board measure, per acre. There are about 250 acres in all, or 1,500,000 feet, board measure.

TABULAR STATEMENT OF TIMBER.

Type.	Area.	AVERAGE PER ACRE.			TOTALS FOR DISTRICT.		
		Ties.	Cordwood	Timber.	Ties.	Pulpwood	Timber.
	Acres.	Pieces.	Cords.	Ft. B. M.	Pieces.	Cords.	Ft. B. M.
Poplar	162,000		7.2			734,400	
Spruce	250			6,000			1,500,000
Spruce and Tamarack. .	55			4,000			220,000
						734,400	1,720,000

OTAUWAU RIVER DISTRICT

This district is bounded on the north and east by the south and west limits of the great Lesser Slave River muskegs, on the south approximately by township tier 69, on the west by the eastern limit of the Swan Hills plateau proper and the Prairie Creek divide.

This district comprises the northeastern foot hills of the Swan Hills. The elevation, therefore, increases towards the southwest. The Otauwau river drains almost the entire district. An important branch of the Southey drains a small poplar area to the southeast, and Jackpine and Meetsu creeks on the north.



PLATE 10. Boulder clay Ridge, Otauwau Trail. Photo F. McVicker, 1911

The Otauwau River valley is steep and broken, being only four miles wide and from 500 to 1,000 feet deep. Between its branches are high ridges of boulder clay, gravel or sand. No agricultural land occurs within the boundaries of this district.

Jack pine creek has its origin in a large basin surrounded by high hills. The basin is floored with hummocks of boulder clay separated by muskegs.

Three main types of timber are to be found in this district:

1. Poplar.
2. Spruce.
3. Pine.

Poplar country bounds this district to the north and east. The hummocks in the head-waters country of Jack Pine creek (Brown Valley), are clothed with reproduction to pole stuff of poplar, birch and jack pine. Underneath this is good reproduction of white spruce. There are some twenty three square miles of this type. North of the big brûlé of 1910 from Meetsu creek to the Otauwau river is an area of some twenty four square miles of mature poplar country composed of trees eight to fourteen inches in diameter with good spruce reproduction underneath. East of the Otauwau river surrounding the timber ridge is another area of forty five square miles of poplar reproduction ten to fifteen years of age, with scattered pole stuff throughout, remnants of a former fire.

The inside boundary of these poplar areas is formed by the great brûlé caused by the fire of 1910, which came from the Swan River valley. This fire entered the district at Florida lake near the centre of the west side of township 71, range 5, west

of the 5th meridian. The head crosses this township with a width of one to two miles. Then it turns south and crosses the west half of township 71, range 4, west of the 5th meridian. A narrow strip along the Ottawa river extends to the great muskeg. Southward from township 71, range 4, west of the 5th meridian, it extends in a branch about three miles wide diagonally across the township named and ends in the northwest corner of township 69, range 3, west of the 5th meridian.

The timber burnt by this fire was, on the south and west, mostly pine, and, on the north and east poplar and spruce tracts which had survived former fires. The area burnt in this district is approximately fifty square miles, of which 25 per cent was good timber.

South and west of the big head the timber is mostly pine, both lodgepole and jack pine, the former predominating. In this region two types may be distinguished. The northern part is a high plateau country broken by steep narrow ravines and containing numerous muskegs. The soil is stony gravelly or sandy. The timber is mostly reproduction of lodgepole pine, jack pine, poplar and spruce, twenty years old. This type covers some forty five square miles.

South of this is an area of some thirty square miles of the same nature, but covered with pole stuff instead of reproduction. Under this pole stand is good young reproduction.

Several patches of good spruce occur in this district. The most important is situated nearly in the southwest part of township 71, range 3, west of the 5th meridian. This timber is on a wide ridge, forming the divide between the Ottawa and Saulteaux rivers. This ridge slopes from the Saulteaux muskeg up about 300 feet in one to one and a half miles. On the top is a plateau one to two miles wide, followed by a gradual descent to the Ottawa. The timber is in the shape of a triangle with a base of four miles and sides of three and a half to four miles, the longest side extending east and west on the south side. Within the limits of the timber patch two creeks descend from the plateau to the muskeg on the east side. The gorges of these creeks cut into the plateau half a mile beyond the general edge. The southern we called Notch creek, and the northern, Spruce creek. One creek flows westerly to the Ottawa. This we called Lodgepole creek because a few scattered lodgepole pine were found near its source. Spruce creek and Lodgepole creek have their common origin in a small muskeg on the plateau.

Three main types of timber are found in this tract, viz., heavy, medium and light. The heavy timber runs fifteen thousand feet, board measure, per acre. It is confined to a patch of 1.5 square miles, lying in the east slope and between the valleys of Notch and Spruce creeks.

This timber is generally of large size, in fairly open stand of white spruce and cottonwood. The trees are limby. They will not average one log clear, but have great height and cylindrical shape. There is approximately 17,500,000 feet there.

West of this on the plateau is lighter forest growth, comprising white and black spruce, poplar and tamarack with small muskeg patches. This timber will average five thousand feet, board measure, per acre. It covers practically the whole of the plateau and descends to the muskeg down the east slope north of Spruce creek. It also comes down the hill south of Notch creek in a narrow band at the southern extremity of the tract.

In the southwest corner a long, narrow spur follows the crest of the ridge one and a half miles beyond the main tract. There are, roughly, 4.66 square miles of this type, or 14,900,000 feet in all.

North of Lodgepole creek is an area on the upper western slopes of the ridge which consists of better timber than the plateau type. This runs ten thousand feet, board measure, over one square mile, or about 6,400,000 feet in all. This timber is white and black spruce and poplar.

Just at the edge of the great muskeg between Notch and Spruce creeks below the timber ridge is a narrow belt of tamarack, about twenty-five acres in all. This will run forty ties per acre, or 1,000 ties in all.

Thus there are found on this ridge a total of 100,000 feet board measure, a very valuable quantity of timber in a country so largely ravaged by fire as this.

Unfortunately this timber is mostly inaccessible at present. That part lying on the plateau and on the west slopes can be reached only by the Ottawa river, three miles to the west, a difficult stream when the log jams are cleared. The heavy timber, however, lying in the east slopes will either have to be floated up steep hill and thence to the Ottawa, or it will have to be taken by road to the Saskatchewan river. This river is drivable in high water when the log jams are cleared out. It is unfortunate that two rivers should have to be cleared out. Both of them, owing to the presence of large burnt areas in their watersheds, are subject to alternate periods of very high and very low waters. During their freshets, great quantities of timber and other debris are carried down. This blocks the rivers and forms levee formations which, when the flood subsides, prove in possible barriers. These river obstructions



Photo F. McVicker, 1911

PLATE 11. High Water on Saskatchewan River, showing Log jams.

to fifteen feet above the ordinary level. Hence considerable trouble and expense will be necessary to get these timbers out.

In or near section 32, township 70, range 4, west of the 5th meridian, is a small area of spruce about one and a half to half a mile wide. This area runs about 5,000 feet per acre over 100 acres, or approximately two million, (2,000,000) feet in all. It is spruce and cottonwood. It is within half a mile of the Ottawa river and can be easily landed when the large patch is logged.

Four miles south of this area is a larger area about two miles running 8,000 feet, board measure, per acre, or 10,000,000 feet in all. This timber is the usual spruce-cottonwood type. It is situated on a ridge three miles southeast of a branch of the Ottawa, to which it can be hauled easily.

On the western boundary of this district on the lower slopes of a high ridge just south of the big burn is an area of 400 acres of spruce and lodgepole pine, which will run 5,000 feet, board measure, per acre, or 2,000,000 feet in all. This timber will have to be hauled three miles southeast down a creek to the main branch of the Ottawa. Three miles south of this, on the summit of the Ottawa valley, is a patch of 1,000 ties of lodgepole pine. These can be taken one mile southeast to the river.

These are all the timbered areas in this district. It will be seen that the navigability of the greater part of the timber depends on the drivability of the Otsego river. Unfortunately, the periods of high water are irregular. No regular spring freshet occurs as in eastern streams. A flood will come and disappear within one week. Therefore, if this timber is to be used, advantage must be taken of every opportunity. This requires constant watchfulness and a state of continual preparation which will prove costly, and render the extraction of this timber a hazardous task financially.

TABLEAU STATEMENT OF TIMBER

Type	Area	Area in Acres				Timber in Cubic Feet	
		Cottonwood Timber		Pulpwood Timber			
		Acres.	Volume.	Acres.	Volume.	Acres.	Volume.
Poplar	15,000						
Tamarack	25	00			1,000		100,000
Lodgepole Pine	25	200			1,000		
Spruce	1,100			15,000			17,700,000
	500			10,000			0,000,000
	2,000			5,000			11,000,000
	000			5,000			2,000,000
	1,200			0,000			10,000,000
Spruce and Lodgepole Pine	000			5,000			2,000,000
						2,000	100,000 53,000,000

NORTH SLOPES DISTRICT

This district is bounded on the east by the east divide of Prairie creek, on the north by Lesser Slave lake, on the west by the limit of survey, and on the south by the Swan Hills proper, as evidenced by the appearance of the lodgepole pine as the prevailing type.

The characteristic topographical feature of this district is the presence of numerous spur ridges running north to the lake at right angles to the main range of the Swan hills. Between these are many creeks or rivers which have their origin in the plateau behind.

These creeks are from ten to twenty miles long. They flow for the most part in steep, deep valleys. As they approach the lake, however, the valleys open out forming small park-like glades and prairies of good land. Elbows in creeks and overflow flats bear very large cottonwood and spruce in patches. The hillsides are covered for the most part with aspen and birch in which are scattered spruce.

Between Prairie creek and Sawridge creek, behind the muskeg which borders the southeast corner of the lake is an area of some twelve square miles of poplar country which is agricultural land. This has a gentle slope up to the south. The new government wagon road runs through the centre of it. When the prairie patches are filled this will undoubtedly be settled as it is very accessible from Sawridge.

Nine-mile creek flows between the hills right to the shore. Only about two square miles on the point can be considered as valuable land. Part of this bears a heavy stand of spruce.

The east divide of Assineau river is formed by a high ridge which extends almost to the shore. On the west side the valley is lower. Good land extends from Assineau river west, north of the twentieth base line. Between Assineau river and Nine-mile point are many acres of shore hay-lands. These also extend westerly to Wapya and indeed form a fringe all around the lake shore, westerly.

The Swan river is perhaps the most important stream entering the region from the south. Its valley carries the lowland poplar type far into the heart of the Swan hills. The lower twenty miles of this river, from Wapiti to Swan Lake, has prairie patches on either side from the water. There are some two or three square miles of prairie on each prairie here.

Above these areas are patches of heavy coniferous forest growing on the river flats for twenty five miles upstream.

West of Swan river the spur ridges running to the lake are not almost so that, outside of the prairie patches, there is no common area of lowland land covered with poplar. This country stretches from Swan river, westward to the end of the lake. Lack of time prevented an examination of this region, but there should be at least one square mile of arable land between the lake shore and the hills.

East of Swan river lies the so-called north shoulder of the Swan hills, low ridges before which, though not agricultural owing to the roughness of the soil, is pastured all these elements which are to make up the forest zone.



Photo F. McVicker, 1911
PLATE 12.—The Narrows, Lesser Slave Lake, showing Hay-meadows.

Four main timber-types occur in this region:

1. Birch.
2. Poplar.
3. Muskog.
4. Spruce.

The birch type is hardly separable from the poplar, into which it blends. It is found only in isolated localities in small patches, where soil and exposure conditions are suitable. Examples of this type may be seen on the lower slopes of the ridges near the mouth of Nine-mile creek.

The poplar type covers all the northern ends of the spur-ridges coming from the main range. The trees are from three to fourteen inches in diameter at breast-height, with an average of about eight inches. Stands vary in yield according to site conditions; defect, as elsewhere, is bad. The average yield is that worked out above, viz. 7.2 cords per acre. East of the Swan river there are some 125,000 acres of this type within the boundaries of this district. This is a temporary type, the

result of fires in times past. Reproduction of the climax type, i.e., spruce, occurs wherever the humus and light conditions allow. Two rotations will see the spruce again dominant, if fire is kept out.

Muskeg occurs only in small patches. The largest is at the southeast corner of the lake. It occupies an area of some five square miles along the water-front. The plateau between Swan creek and the Assinieu river is burnt muskeg. Other small plateaus at the headwaters of the various creeks rising in this district are largely muskeg, all burnt by the great fire described before.

Many patches of valuable spruce timber occur in this district.

Small tracts along Prairie creek will total five million feet in all. This creek is drivable in high water, so that this timber should be fairly accessible.



Photo F. McVickar, 1911.

PLATE 13.—Spruce at Ninemile Point.

The largest quantity of timber, and that, too, the most accessible, is near Nine-mile point on Lesser Slave lake. There are some five areas of timber here. Three of these are at the mouth of Nine-mile creek. The area nearest the point is situated on an alluvial flat formed by the creek. It is heavy spruce and cottonwood, extending over some 183 acres and running to 20,000 feet, board measure, per acre, or 3,660,000 feet in all. Behind it is an area of a swampy nature, mostly tamarack and

black spruce pole growth; it contains, however, 2,000 feet, board measure, per acre of log timber. There are 96 acres of this, or 192,000 feet in all. The third area is behind the second. It is on the lower slopes of a ridge. The timber here is small-size spruce and tamarack, running 5,000 feet, board measure, per acre over 162 acres, or 810,000 feet in all.

These three areas will, therefore, total approximately 4,062,000 feet, board measure. The furthest haul from the lake required to log this timber would be about one and a half miles.

Some two and a half miles west of Nine-mile point are two other areas close together, one on the lake shore, and the other on the lower slopes of the ridge just behind. These two areas are of the same type approximately. They will run 15,000 feet, board measure, per acre. There are about 600 acres here, or 9,000,000 feet in all.

This is also an ideal logging proposition. One road about a mile long through the centre of the tract would suffice to bring all this timber to the lake shore.

The fifth area is very much larger than the others. It is situated on two ridges, one forming the divide between the two branches of Ninesmile creek, and the other separating the west branch from Canyon creek, which flows into the lake about six miles west of Nine-mile point.

This area parallels the lake about one and a half miles back from the shore. It is a rough quadrilateral in shape, about three and a quarter miles long by two miles wide. There are approximately 4,200 acres in the area.

The timber is spruce and cottonwood on the ridge slopes, and spruce and poplar on the tops. The yield varies according to site conditions: samples show timber running from 12,000 feet, board measure, to 30,000 feet, board measure, per acre. Putting the average at 15,000 feet, board measure, per acre (a conservative estimate), this area contains 63,000,000 feet, board measure.

At least three main roads will be required to log this timber, one down each branch of Nine-mile creek and one down Canyon creek.

The shore area around the lake will prove ample for the needs of settlers for some time to come. Therefore, the nearest market for such a quantity of timber will be Athabaska Landing. Inasmuch as this timber is not over-mature yet, it will probably be better to let it stand for some time, until a local demand will require it. This is sure to come in the near future as the country fills up.

About two miles up the Assineau river and a mile west from it is a small area of young timber, spruce and poplar. There are about 600 acres here which will run 5,000 feet, board measure, per acre, or 3,000,000 feet in all. These can be driven down to the lake in high water, or hauled direct two miles.

At the foot of Auger bay, about three miles west of Assineau river is a crescent-shaped area of spruce, with 10 to 15 per cent of tamarack. This area is about three miles long by one mile wide. It fringes the shore sloughs at the point. This timber will run about 12,000 feet, board measure, per acre, or approximately 23,000,000 feet in all; it is practically on the shore, and therefore very handy.

The next timber in this district is to be found on Swan creek. There are five areas here, remnants of a stand which once clothed the entire valley.

Three of these are on the north slopes of the valley and two on the south.

The timber on the north nearest the Swan river has been called Area No. 1. This area is situated on the slopes of the ridge about half a mile back from Swan creek at its nearest point. It is surrounded on all sides by a recently-made brûlé, the result of the fire of 1910, which burnt much valuable timber. This area contains 665 acres of spruce and poplar.

Area II is next up the creek on the north side. It contains some 570 acres of the same type.

Area III is farthest up the creek on the north side. It covers some 595 acres, approximately.

Area IV is nearest Swan river on the south side of Swan creek. It covers some 987 acres.

Area V is the smallest. It is about a quarter of a mile up-creek from Area IV. It has some 250 acres.

These areas, according to samples taken, run from 15,000 to 30,000 feet, board measure, per acre. Putting the general average at 15,000 feet, board measure, per acre, which will amply discount any defect or loss by windfall, we have:

		Ft. B.M.
Area I	665 acres.....	9,975,000
" II	570 "	8,550,000
" III	505 "	8,025,000
" IV	987 "	14,800,000
" V	250 "	3,750,000
		<hr/> 46,000,000

This timber can be skidded into Swan creek and driven from there into Swan river, and thence to the lake, if desired. It is practically all within the boundary of the proposed Swan Hills Forest Reserve. I would recommend that it be left standing a while, for the purpose of supplying the future needs of the Swan River valley settlers. Great care will have to be taken, however, to keep fire out, as the debris of the 1910 fire forms a veritable fire-trap.

Water-power sufficient to drive a small mill can be obtained in Swan creek between three and four miles above Swan river, so that when the demand comes, this timber can be cut *in situ*. This is feasible because the Swan River settlement extends to the junction of Swan creek with Swan river. The farmers could haul lumber themselves from the mill to their farms.

Township 71, range 10, and township 71, range 11, west of the 5th Dominion meridian, have also timber. These areas are situated on the upper slopes of three hills forming the outer edge of the Swan Hills elevations.

The one nearest the Swan river is situated in or near section 9, township 71, range 10, west of the 5th meridian. The timber is on the northern slope of a spur-ridge running easterly to Swan river. It consists of spruce and poplar. The edge of the timber proper is not sharply defined, but gradually changes to poplar, giving a transition zone on either side.

The main area has some 320 acres, which will run 15,000 feet, board measure, per acre, or 4,800,000 feet in all. The transition areas will average 1,000 feet, board measure per acre, over 200 acres, or 200,000 feet, board measure, in all. This timber can be hauled to the Swan river along the north slope of the ridge east four to five miles.

About two miles northwest of this area is a round hill which has on its north-west side some 270 acres of heavy timber, spruce, balsam fir and poplar. This will run 10,000 feet, board measure, per acre, or 2,700,000 feet in all. East of it is a large area of scattered spruce and poplar about 1,000 feet, board measure, per acre over 600 acres, or 600,000 feet in all.

This timber can probably be taken out by an extension of the road required to get at the former area.

The principal timber of this region, however, lies to the west of these areas. It occupies a strip down the middle of township 71, range 11, west of the 5th meridian, the main body being towards the north end of the township principally in sections 27 and 34.

This main area lies on the north slope and at the foot of a ridge adjoining the head-waters of Giroux creek. The timber is spruce and balsam fir, poplar being very rare. It will run 15,000 feet, board measure, per acre over 2,180 acres, or 32,700,000 feet in all.

This timber is mature now and is beginning to get wind-thrown, especially on the slope. It should be cut or thinned as soon as possible. The top of the ridge has a pole stand of spruce and balsam fir over about 400 acres.

The upper part of the south slope of the ridge has an elbow-shaped area of younger growth which will average 10,000 feet, board measure, per acre. There are about 950 acres in this area, or 9,500,000 feet in all.

This timber is rather inaccessible. The nearest way to the lake is down Giroux creek to the foot of Giroux bay. This would require a haul of from nine to ten miles. A good, easy slope can, however, be obtained here.

The Swan river above Swan creek has scattered small areas of spruce in the elbows. These will not average over fifteen acres per area. The average run is about 10,000 to 15,000 feet, board measure. Between the junction of the Klondyke trail, and the Swan River wagon road there are some seventeen such areas. These were examined in detail; the results are given in the table below.

All this timber above Swan creek grows right on the river shore. It can be rolled in and driven down in high water with very little trouble.

Swan River Timber.

Approximate Location.	Area No.	Acres.	Average per Acre.	Total
			Ft. B.M.	Ft. B.M.
5 70 9 5	I	10	20,000	200,000
"	II	2	15,000	30,000
32 70 9 5	III	4	10,000	40,000
"	IV	1	10,000	10,000
"	V	4	12,000	48,000
4 71 9 5	VI	6	10,000	60,000
"	VII	20	20,000	400,000
18 71 9 5	VIII	10	2,000	20,000
12 71 9 5	IX	80	15,000	1,200,000
"	X	10	10,000	100,000
30 71 9 5	XI	35	20,000	700,000
"	XII	6	12,000	72,000
31-71 9 5	XIII	15	2,000	30,000
"	XIV	28	15,000	420,000
"	XV	10	10,000	100,000
32 71 9 5	XVI	12	10,000	120,000
5 72 9 5	XVII	2	5,000	10,000
				3,560,000

TABULAR STATEMENT OF TIMBER.

Type.	Area.	AVERAGE PER ACRE.			TOTALS FOR DISTRICT.		
		Ties.	Cost-wood.	Timber.	Ties.	Pulp-wood.	Timber.
	Acres.	Pieces.	Cords.	Ft. B.M.	Pieces.	Cords.	Ft. B.M.
Poplar	135,000		7.2			972,000	
Spruce	225,000		7.2			1,620,000	
	Prairie Creek.						
	183			20,000			3,000,000
	96			2,000			3,000,000
	102			5,000			102,000
	600			15,000			810,000
	4,200			15,000			9,000,000
	600			15,000			63,000,000
	1,017			5,000			3,000,000
	665			12,000			24,000,000
	570			15,000			9,975,000
	505			15,000			8,550,000
	987			15,000			8,125,000
	250			15,000			14,805,000
	320			15,000			3,750,000
	200			15,000			4,800,000
	270			1,000			200,000
	600			10,000			2,700,000
	2,180			1,000			600,000
	950			15,000			32,700,000
	Swan River below Klondyke Trail			10,000			9,500,000
							3,500,000
						2,592,000	207,727,000

SWAN HILLS DISTRICT.

This district, for that part west of Swan river, is bounded on the north by the northmost range of foot-hills of the Swan Hills plateau. East of Swan river it is bounded by the south edge of the great brûlé of 1910 to the neighbourhood of Florida lake in township 71, range 5, west of the fifth meridian.

The eastern boundary is the edge of the high plateau country proper, extending in a general southerly direction from Florida lake to the Saulteux river. Thence it turns southwesterly to a point near the northeast corner of township 66, range 9, west of the 5th Dominion meridian, then southeast again along the range forming the north side of the valley of the Freeman river to the limit of survey. The lower Freeman valley is excluded. The boundary to the south and the west is beyond the line of survey; it is taken to include all that high, broken plateau country similar to the part surveyed.

This district lies within the bounds of the high plateau country exclusively. It may be described as a high plateau of from 3,000 to 4,000 feet elevation, broken by many deep, steep, narrow river-valleys, radiating in all directions. The principal rivers are the Swan, Driftpile and Prairie, flowing north into Lesser Slave Lake, and the Freeman flowing southeast into the Athabaska river. The Saulteux river takes its rise in the eastern extension of this district. The summit elevation of the plateau is a level country with low, isolated ridges of boulder-clay.

No agricultural land occurs in this district excepting, perhaps, one or two isolated areas of from five to ten acres along the Swan river. In general, the whole district is covered with a heavy blanket-layer of boulder-clay. This is so thick that the Swan River valley, although eroded 1,500 feet below plateau level, shows no signs of country-rock.

Drift lignite occurs commonly in the Swan River valley. Stratified seams were seen in the boulder-clay, some as much as four feet thick. Great gravel-bars occur in the beds of all the creeks. Traces of gold were found in most of them, and it is just possible that it may be found in paying quantities later.

Two main timber-types occur in this district:

1. Lodgepole pine (slopes type).
2. Summit-plateau type.

These types were considered before in the general discussion on timber types and need not be gone into again. Approximately 60 per cent of the area is occupied by the lodgepole pine type and 40 per cent by the summit-plateau type.

Fire has done very little damage in this district, probably in consequence of its inaccessibility and the percentage of wet muskeg in its area. Along the Klondyke trail are two small brûlés, one in township 69, range 9, west of the 5th meridian, covering about four square miles, burnt last year, and one in township 68, range 8, west of the 5th meridian, covering about the same area.

The only other fire noticed was near the head-waters of the Swan river in townships 66 and 67, range 12, west of the 5th meridian, where some ten square miles have been burnt. With these exceptions and some ten square miles of wet tamarack swamp around Freeman lake, practically the whole area is occupied by one or the other of the types mentioned.

Spruce timber occurs in isolated areas along the Swan river above the junction of the Klondyke trail, which part of the valley lies within the district. These areas were not examined closely, but should run about 250,000 feet, board measure, to a mile of river valley. There are about twenty miles of valley above the trail where spruce occurs. This gives a total of 5,000,000 feet. The north shore of Freeman lake also has a small area of spruce, probably five million feet in all.

TABULAR STATEMENT OF TIMBER.

Type.	Area.	AVERAGE PER ACRE.			TOTALS FOR DISTRICT.		
		Ties.	Cordwood	Timber.	Ties.	Pulpwood	Timber.
	Acres.	Pieces.	Cords.	Ft. B.M.	Pieces.	Cords.	Ft. B.M.
Lodgepole Pine.....	60,000	25	.....	.....	1,500,000	.....	.....
	1,150,000	.....	5	.....	.....	5,780,000	.....
Spruce.....	Freeman Lake	.....	.....	.....	.....	.....	5,000,000
	Swan River Valley..	.....	.....	.....	.....	.....	5,000,000
					1,500,000	5,780,000	10,000,000

UPPER SAULTEUX DISTRICT.

This district is bounded on the north by the south limits of the Otauwau river district, i.e., township 69 approximately; on the east by a line drawn from the northeast corner of township 69, range 3, west of the 5th meridian, to the northeast corner of township 67, range 5, west of the 5th meridian, approximately; on the south by township tier 67 approximately, and on the west by the edge of high plateau country proper, i.e., the east boundary of the Swan Hills district.

This district is the eastern slope of the Swan Hills plateau. It varies from high, broken ridges on the west down to flat muskeg on the east side. The Saulteux river and its branches drain the whole district.

The district as a whole is underlain by the usual boulder-clay. Sand ridges occur towards the southeast.

South of the Saulteux river in township 68, ranges 5 and 6, west of the 5th meridian, is a slope of gradually rising poplar country, which has areas of good land. This region is, however, too isolated and surrounded by impassable muskegs to be of any value agriculturally. Three main timber-types occur in this district:

1. Poplar-pine.
2. Poplar.
3. Spruce.

The poplar-pine type occurs over all the district north of the Saulteux river. It is mostly pole stuff of lodgepole pine, jack pine, and poplar from two to eight inches in diameter at breast-height. Muskeg occurs in spots between ridges. The percentage of species is about 50 per cent poplar, 35 per cent lodgepole pine and 15 per cent jack pine. This timber is mostly rather small for pulp yet, but will cut five cords per acre over 72,000 acres, or 360,000 cords.

South of the Saulteux river is the poplar type. This is the ordinary type seen in the north slopes district, i.e., poplar with slight admixture of spruce, and, here, pine, also. It will run about 7.2 cords per acre, the same as the rest. There are some 60,000 acres of this type, or 432,000 cords in all.

Several areas of spruce occur in this district, the largest being in the valley of the Saulteux river, mostly in township 68, range 6, west of the 5th Dominion meridian. This timber is a narrow strip along the river with a wide patch at the east end, at the junction of a tributary coming from the north. The tract is very hard to get at and was not cruised, but there will be at least 5,000 acres running 10,000 feet, board measure, per acre, or 50,000,000 feet in all.

The northeast corner of the district has a small area of timber, about 200 acres, and running 10,000 feet, board measure, per acre, or 2,000,000 feet in all. Where the Prairie Creek trail crosses the Saulteux is another small area of ten acres, running 10,000 feet, board measure, per acre, or, altogether, 100,000 feet, board measure. One and a half miles northeast of this spot is another small area containing about 50,000 feet, board measure, and one mile still farther northeast, is a slightly larger patch of some 100 acres, containing about 1,000,000 feet. In the northeast corner of this district are two other small areas of spruce. These two will total about 300 acres at 10,000 feet, board measure, per acre, or 3,000,000 feet in all.

All this timber is practically inaccessible for the present at least, because the Saulteux river, especially in the upper part, is not drivable, unless a good deal of time and money were to be spent on improvements. The bed of the river is a succession of gravel-bars, covered only by very high water. Most of these bars have huge accumulations of driftwood which sometimes form jams across the river.

TABLEAU STATEMENT OF TIMBER.

Type.	Area.	AVERAGE PER ACRE.			TOTALS FOR DISTRICT.		
		Ties.			Ties.		
		Cordwood Timber.			Pulpwood Timber.		
	Acres.	Pieces.	Cords.	Ft. B.M.	Pieces.	Cords.	Ft. B.M.
Poplar-pine.....	72,000		5			360,000	
Poplar.....	60,000		7.2			432,000	
Spruce.....	5,000			10,000			50,000,000
	200			10,000			2,000,000
	10			10,000			100,000
	5			10,000			50,000
	100			10,000			1,000,000
	300			10,000			3,000,000
						792,000	56,150,000



Photo D. Roy Cameron, Fall.
 PLATE 14. Lodgepole Pine Remnants near Deep Creek.

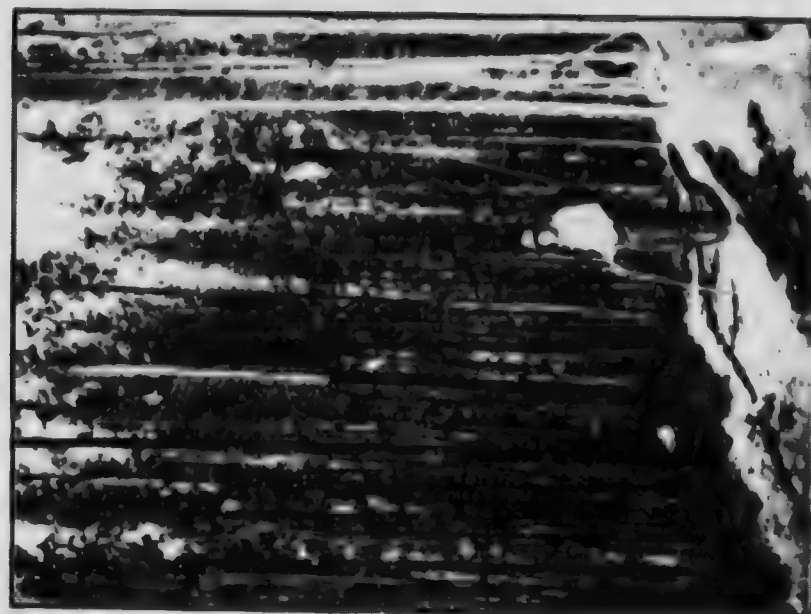


Photo D. Roy Cameron, Fall.
 PLATE 15. Lodgepole Pine Ridge in Hanged and Lined Type
 The St. Regis, N. W. A.

VERMILION CREEK DISTRICT

This district is bounded on the north by the Upper Montreux district, on the west by the Swan Hills district, on the south by the limit of survey and on the east by a line drawn southerly down the middle of range 5 from township 67.

The district is, on the whole, flat, but descends by gradual steps to the southeast. It is drained by several small creeks flowing easterly or southeasterly. The most important of these are Soda creek, Vermilion creek and Deep creek. The last-named forms the south limit of the district. The muskeg predominates over the ridges in the northern half of the district and vice versa to the south. At Deep creek comparatively dry land is reached. South of here is good land to the Athabaska river.

No agricultural land occurs in this district, although it is bounded on the southeast by poplar country; fair land extends southerly to Athabaska river.

This district is covered entirely with the height-of-land type explained before, ridges of lodgepole pine, rounded by muskeg. The stand is young, spindly pole stuff, mostly under four inches in diameter at breast-height, and not capable of yielding even pulpwood yet. With the exception of three places along the Klondyke trail, no fires have occurred in this country for many years.

Some five square miles in the northwest corner of the district in township 67, range 8, west of the fifth Dominion meridian, have been burnt recently. Three square miles have been burnt in township 65, range 7, west of 5th meridian, and a considerable area (some twelve square miles) along Deep creek, at the south end of the district, in township 65, range 6, west of the 5th meridian. Good reproduction of lodgepole pine occurs on these last two burns. No pulpwood, cordwood, tie-timber, or saw-timber occurs in this district.



COUTTS RIVER DISTRICT

This district is bounded on the north by the Lesser Slave River Valley district, on the west by Upper Saulteaux and Vermilion Creek district, and on the south and east by the limit of survey.

Coutts river runs through the centre of this district lengthwise. The Saulteaux river runs along the northwest side. The main part of the district is occupied by the valleys of these rivers and the watershed between them which consists of low ridges. The north part of the district is low, mostly muskeg. A long low ridge forming the east rim of the Coutts River valley is taken as the east side of the district.

Most of the district is sand or stumps. The northern end has boulders of granite, and muskeg. No agricultural land occurs in this district.

Most of this district is covered with a poor stand of jack pine, poplar growth. This will run over the entire area. There are cords of wood per acre. There are some muskeg areas, of 2,250,000 ties, and 450,000,000 cords of wood.

North of this sand region is an area of partially burnt jack pine poplar country mixed with muskeg. Sixty per cent of the country is timbered with five cords of pulpwood per acre. There are, altogether, some 24,000 acres of which 14,000 are timbered. This gives 72,000 cords of pulpwood.

North of this tract, again, at the stream north end of the district is muskeg with ridges of jack pine poplar stuff too small to be of use yet. There are some twenty square miles of this type.

TABLEAU STATEMENT OF TIMBER

Type	Area	AVERAGE PER ACRE			TOTALS FOR DISTRICT		
		Ties	Cordwood	Timber	Ties	Pulpwood	Timber
		Acres	Pieces	Cords	Fe. B.M.	Pieces	Cords
Jack Pine	100,000	25		5		2,250,000	450,000
Poplar Jack Pine and Spruce	14,000			5			72,000
						2,250,000	522,000

PROPOSED FOREST RESERVES.

From the foregoing report it will be seen that there are large areas of non-agricultural land both north and south of the lake. These areas are, in general, more or less elevated regions and form the head-waters of streams draining in every direction. The question of the preservation of the forest cover, so that as even a flow of water as possible may be insured, is an important one in this district because the main drainage streams are navigable rivers. Of late years, the continual denudation of the country containing the head-waters of the Lesser Slave River tributaries by fire has given rise to alternating conditions of very low and very high water, which has proved very harmful to navigation. Indeed, things have come already to such a pass that every wind storm means a miniature freshet, and a week's rain, a swollen torrent, bringing down trees and driftwood of all kinds, which is a menace to navigation. The principal rivers causing this are the Moose, Driftpile, Saulteaux and Ottauwau.

The effect of these varying conditions is felt especially keenly in that part of the Lesser Slave river between Saulteaux Landing and the mouth of the river at Mirror landing. Between these two places is a twenty-mile stretch of river, which is one continual succession of rapids. On this stretch the government has already expended over

present on wing dams to direct water into one channel so that the river will be navigable for small, light-draft steamers. The floods of the last year or two collected recent fires have been especially severe and have destroyed many of the dams and shifted others.

The steamers can ascend these rapids only when there is an even average flow of water. At present the water is usually very low or too high. Timmer is as the development of this country depends, for the present at least, on communication by water, the importance of preserving stream flow is manifest.

Besides this direct effect on navigation, these freshets are filling the beds of smaller creeks and tributaries with gravel and driftwood, spoiling them for driving purposes. In many cases they are tearing away acres of good alluvial land in the flats toward their mouths.

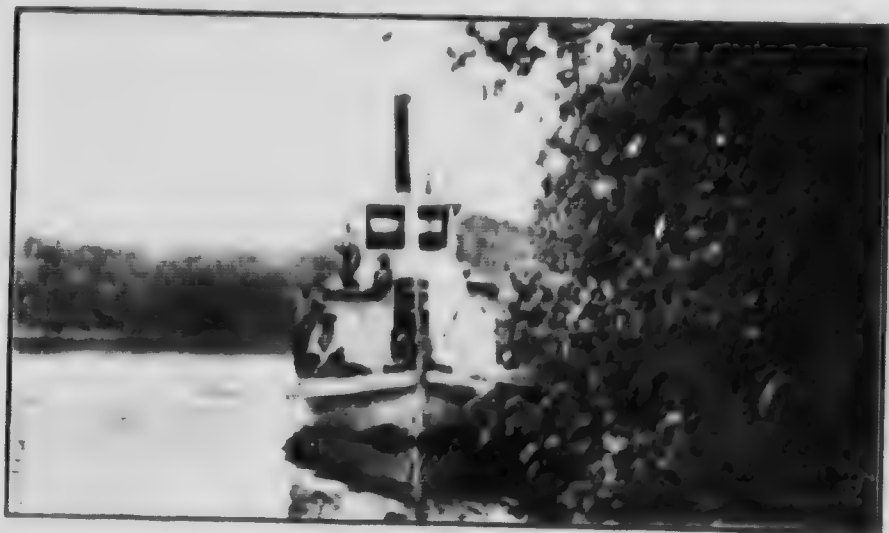


PLATE 17.—Steamer on Lesser Slave River. Photo F. McVickar, 1911

The recent fires have another effect which, while not felt so directly at present as the floods, is yet in the long run more disastrous in its consequences. I refer to erosion. In that part of this report dealing with soil conditions, the northern face of the Swan hills is described as a large area of land much broken by cross-ridges and deep ravines, but covered to a considerable depth with a fine clay loam soil mixed with stones. This region is a spruce site of the first quality, but since the second fire, which occurred in 1910, erosion is rapidly stripping off this fertile soil and laying bare the underlying boulder-clay.

Great as the damage already done by fire is, it is insignificant when compared with possibilities for destruction which are rapidly becoming probabilities as the country fills up.

When it is considered that practically the whole interior country of the Swan hills is covered with a stand of young timber which will double its yield in twenty years, and that the increasing use of the Klondike trail as a route to enter the Peace River country is jeopardizing this stand more and more every year, it is easy to see how imperative is the necessity of adequate fire-protection. In the same way, the Waldshaw trail is a constant menace to the pine and spruce areas on Martin mountain.

Within a few years the prairie lands over toward the Peace will be filled. When this time comes, the tide of immigration which at present neglects the Lesser Slave

lake country will turn in this direction. It is certain that large areas of land around Lesser Slave lake and the Lesser Slave and Athabaska rivers are suitable for agriculture. These areas will undoubtedly be settled in the next twenty-five years.

When this time comes, the Swan Hills country will be surrounded by settlements on three sides at least, viz., north, east and south. It will, therefore, be the natural source of timber supply for these communities, and, indeed, practically the only source of supply available. To a great extent, therefore, the future welfare of a large section of the country depends on the conservation of timber in the Swan hills. The same is true to a lesser extent for the Martin Mountain country, where settlement will probably, for some time at least, be confined to the south side.

For these reasons—namely: (1) that the areas in question are absolute forest land, unsuitable for agriculture; (2) that it is of the utmost importance that they be kept covered with a forest growth to regulate water supply; (3) to prevent further erosion, and (4) provide an adequate timber supply for the future—I beg to recommend that forest reserves be established on these areas as soon as possible.

In the case of the lands included within the boundaries given for the proposed Martin Mountain reserves, only the Martin Mountain elevation was taken. North of Lesser Slave lake it is possible to find non-agricultural lands extending from the west end of the lake east along to the Athabaska river, and north for an indefinite distance. This country, however, outside of Martin mountain, is flat and largely muskeg. It is also out of the track of travel, and therefore not in any especial danger from fire.

A westward extension might be made to the agricultural land west of the lake. Lack of time prevented examining this, so the reserve, as recommended, is cut off at the west side of Martin mountain.

The north and east boundaries are arbitrary. They were taken to include in a general way the watershed between the Lesser Slave and Wabiskaw waters.

The southern boundary was mapped in as carefully as was possible in a country where surveys are infrequent.

From the above it will be seen that this reserve is of the nature of a nucleus to which extensions may be made west, north or east, as the need arises. In its present shape it includes the most important country for reserves purposes north of the lake, as far as watershed protection and timber supply are concerned.

These same remarks apply in a general manner to the Swan Hills reserve also. Here the north boundary, east of Driftpile river and the southeast boundary were mapped in to include approximately all the non-agricultural land. Lack of time prevented an examination of that part of the reserve west of range 12, more than a general view with the aid of field-glasses afforded. The reserve lines given west of this range, therefore, are purely arbitrary, and are mapped in to include only the head waters of the many streams flowing out of the Swan Hills to the north, west and south. They are conservative boundaries; a further examination of this district will probably show the advisability of including more land in the reserve. However, a safe nucleus has been taken to which additions can be easily made.

FIRE PROTECTION.

The present system of fire protection around Lesser Slave lake is totally inadequate. Two men have to guard a district 200 miles long by 25 miles wide. This country is travelled nearly every day by immigrants and settlers, both of whom are notoriously careless with fires. To make matters worse, the trails are very poor—almost impassable most of the time—and labor to help fight fires once started is very difficult to secure.

No patrol of any kind is exercised along the Klondyke trail, which has settlements at either end.

There are certain points surrounding these reserves which are dangerous.

These are:

1. Lower Slave River Valley.
2. North shore of Lesser Slave Lake.
3. Swan River Settlement.
4. Settlements at the West End of the Lake.
5. Logging Camps in Township 66, range 20, and other proposed Swan Hills reserves.
6. Fort Assiniboine Settlement.
7. Klondike Trail.
8. Assiniboine Trail.
9. Wabiskaw Trail.

Any system of fire protection, to be efficient, must have a provision for patrolling these points. The schedule of ranger districts given below has been drawn up to ensure this protection. It provides for seven rangers and a chief ranger to supervise them and coordinate their work. The districts proposed are as follows:

I. LOWER LESSER SLAVE AND ATHABASKA RIVER VALLEYS

Headquarters.—Mirror Landing

Range.—From Moose Lake and Moose portage on the east to Saulteaux landing on the west and south from Mirror landing up the west side of the Athabaska as far as the Akumuk river. The object of this district is to provide a patrol along the travelled trail from Athabaska landing to the Peace river. In off seasons some improvement work can be done in building pack trails north to the east end of Moose Lake and south up the Athabaska river, which is too swift for canoes.

II. EASTERN SWAN HILLS

Headquarters.—Sawridge

Range.—From Saulteaux landing to Sawridge and south over the Assiniboine trail, which is much used by Indians, as far as possible. This district will guard the main road and the eastern part of the Swan Hills reserve, including the valuable timber in township 71, range 3, west of the 85th meridian.

Improvements will be needed on the Assiniboine trail. A little money spent here will open up a large area of hitherto almost inaccessible country.

III. LESSER SLAVE LAKE

Headquarters.—Sawridge

A small stern-wheel, light-draft steamer is badly needed to patrol the lake-front on both sides. The trails are such that it is almost impossible to get around the lake shore with any speed. This boat can efficiently patrol the whole lake and will prove more economical in the long run than rangers with pack outfits winding slowly around the beach on either side.

IV. MARTIN MOUNTAIN

Headquarters.—Mouth of Martin creek

Range.—Wabiskaw and Muskeg Creek trails.

This ranger could occupy most of his time doing trail improvement work on the Martin Mountain reserve, such as improvement of the Halfway Creek trail and a look-out on Martin mountain. It is important, if the reserve is established, to have some man on guard, even if just to show the public that the Forestry Branch is alive to its duty in this regard. There is enough travel over the Wabiskaw trail by Indians to justify a patrol.

V. SWAN HILLS NORTH.

Headquarters.—Swan River Settlement.

Range.—Along wagon roads, Assineau river to Driftpile river, south up Swan River valley to Soda creek on Klondyke trail and to Freeman lake.

This is one of the most important districts. It guards the Klondyke trail right to the head of the Swan Hills reserve, and insures against carelessness of settlers in the Swan River valley who at present are unwatched. The Klondyke trail, in ordinary years, is in pretty good condition. Some improvement work done on the Freeman lake trail and a trail up Inverness river will open up a large section of the interior plateau country.

VI. WEST END OF LAKE.

Range.—Driftpile river to Little Smoky river, and country around Snipe lake.

This district is to guard the settlements at the west end of the lake and the timbered country around Snipe lake, where there are many timber berths. It will also serve to lessen fire danger in the northwest corner of the reserve.

VII. SWAN HILLS SOUTH.

Headquarters.—Deep Creek.

Range.—Fort Assiniboine to Soda Creek on Klondyke trail, Lower Freeman river, and down Athabaska to Akuinu river.

This district is primarily to guard the southern half of the Klondyke trail. Several trails are badly needed here, also, to open up the southeast part of the reserve, e.g., one from Deep creek to the Assiniboine trail and one from Deep creek to Freeman lake.

From the above it will be seen that no provision is made for patrolling that part of the reserve west of range 12. This part of the reserve is so inaccessible and isolated at present, that the fire danger is not very great. Further information regarding trails, &c., in this district is necessary before ranger districts can be planned.

The above districts are based on the assumption that the forest reserves will be established in the near future. If this is not done, it will be sufficient for the present to combine districts I, II and IV into one.

The first necessity is a patrol of the Klondyke trail, for which two rangers are needed, one at each end. Whether reserves are established or not, it is advisable that besides these rangers a chief ranger should be appointed to supervise them and keep them to their work. A man is needed to supervise and control trail-building, if for nothing else.

TRAIL IMPROVEMENTS AND EXTENSIONS.

The following improvements and extensions of existing trails are suggested as advisable and necessary where forest reserves are established.

IMPROVEMENTS.

(These are urgently needed to open up the reserves.)

1. Moose Portage trail. Moose Portage to east end of Moose lake. Seven miles.
2. Assiniboine trail. Sawridge to junction with Klondyke trail. Eighty miles.
3. Otawau trail. Sawridge to junction with Assiniboine river. Fifty miles.
4. Wabiskaw trail. Mouth of Martin creek to 20th base line. Twenty miles.
5. Half-way Creek trail. Lake shore to summit of Martin mountain. Five miles.
6. Muskeg Creek trail. Lake shore (northeast corner) easterly to Driftwood river. Twenty five miles.

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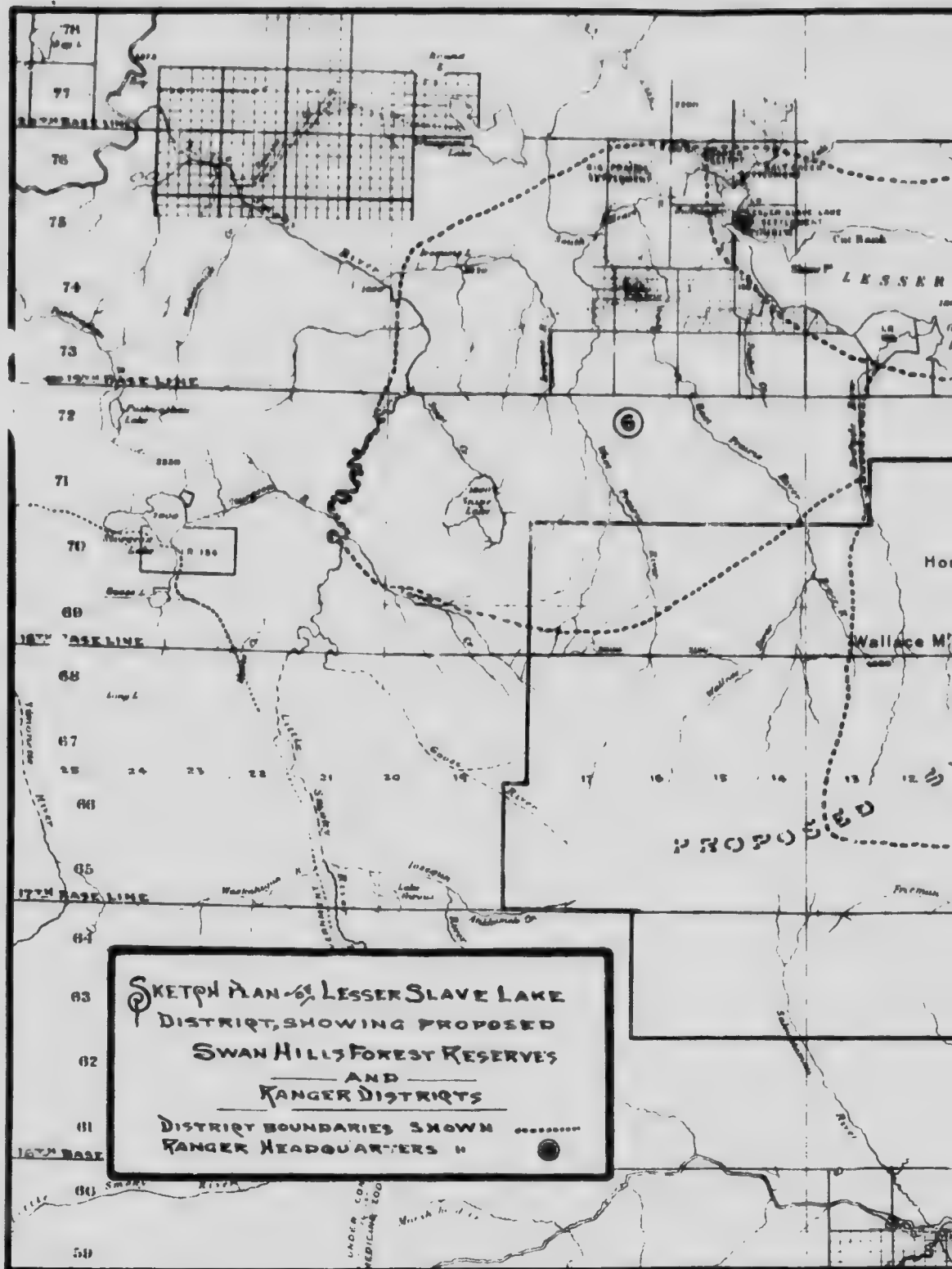
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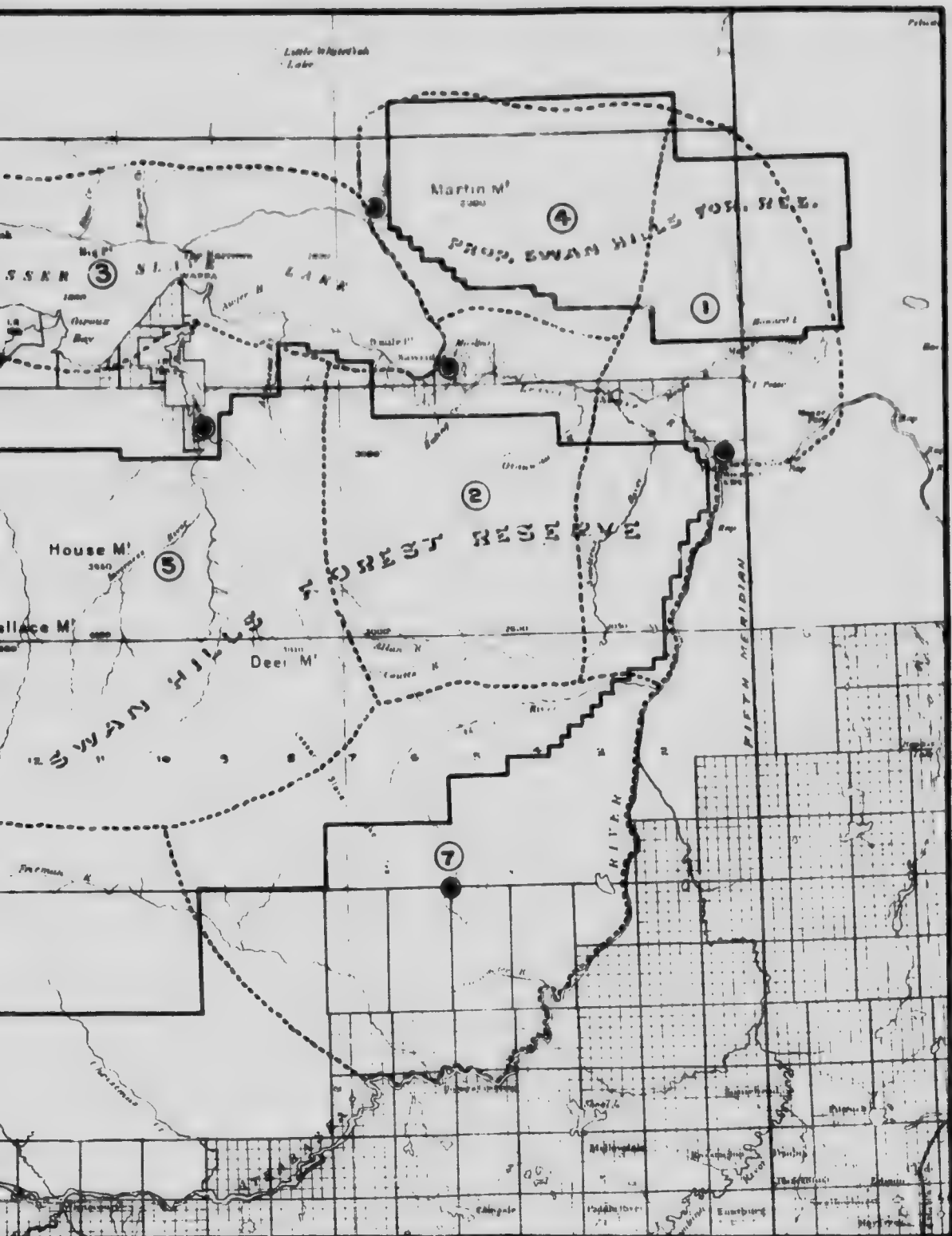
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7. Freeman Lake trail. From where Klondyke trail reaches Swan river, up said river, and across to Freeman lake. Thirty-five miles.

PROPOSED EXTENSIONS.

I. Primary. (Urgently needed).

1. Moose lake. From Mirror landing to the west end of Moose lake. Fifteen miles.

2. Martin Mountain. From Lily lake (west summit of Martin mountain), to the west branch of Muskeg creek. Ten miles.

3. From Lily lake (west summit of Martin mountain) to Wabiskaw trail in or near section 7, township 76, range 5, west of the 5th meridian. Five miles.

4. Athabaska River. From Mirror landing south up river to mouth of Akaiuu river. Twenty-five miles.

5. Ottauwan River. From mouth of Ottauwan river up stream to timber ridge in southwest corner township 71, range 3, west of the 5th meridian. Fifteen miles.

6. Nine-mile Creek. From mouth of the Nine-mile creek up to timber ridge, and across to meet Assinemu river trail at 19th base line, thence up west branch Assinemu river and across to Swan Creek trail near southeast corner township 72, range 9, west of the 5th meridian. Fifteen miles.

7. Giroux Ridge. From section 7, township 72, range 9, west of the 5th meridian, up Upset Creek to timber ridge in township 71, range 11, west of the 5th meridian. Ten miles.

8. From mouth of Inverness river upstream to summit of Table mountain, near southeast corner township 70, range 11, west of the 5th meridian. Fifteen miles.

9. From where Klondyke trail crosses Soda Creek to Ottauwan trail where it reaches Saulteux river, somewhere in township 68, range 5, west of the 5th meridian. Twenty miles.

II. Secondary.

1. From west end Moose lake to join Muskeg Creek trail at Driftwood river, thence northwest to Divide lake. Thirty miles.

2. From Ottauwan timber ridge, southeast corner, west to where Assiniboine trail crosses Ottauwan river. Ten miles.

3. From Prairie creek trail below Hay mountain up Prairie creek to head-waters and across divide to head-waters of Swan creek, then down this creek to Swan River trail. Twenty miles.

4. From where Klondyke trail crosses 17th base line, easterly to Assiniboine trail somewhere in west of the 5th meridian. Fifteen miles.

5. From Deep creek westerly to Freeman lake trail near Freeman lake. Twenty miles.

The above extensions are divided into primary and secondary, those urgently needed and those advisable when a reserve is established, for the purpose of opening up the reserve.

LOOKOUT STATIONS.

In connection with some of these more important trails, there are certain places where lookouts should be established. Such places are:

I. West Peak of Martin Mountain.—About a mile west of Lily lake at the head of the present Half-way Creek trail is a rounded elevation forming the west peak of Martin mountain. From the summit of this, an unobstructed view can be obtained in any direction. A lookout here would be of immense advantage in protecting the Martin Mountain country. It would be more efficient than a patrol beat of many days journey, and is only six miles from the lake.

II. High Peak.—This ridge is about two miles southwest of Florida lake. It is situated in or near section 14, township 71, range 6, west of the 5th meridian. From

its summit a magnificent view can be obtained north to Sawridge, east to Moose lake and the Athabaska valley, and south to the Athabaska valley. It is situated about fifteen miles south of Sawridge. Eight miles of the Oumwan trail will need improving to render this necessary.

III. Table Mountain (House Mountain).—This mountain is an isolated ridge of the same elevation as the main range. It overlooks the south side of the lake west of the Swan river and the most of the Swan river, Driftpile and East Prairie river valleys.

Some fifteen miles of trail up the Inverness river will be needed to reach this place, but it is a most strategic point and should be made available as soon as possible.

IV. Brulé Ridge.—This is where the Klondyke trail crosses the range forming the east side of the valley of the Swan river. From here a view is obtained up the Swan River valley to its head-waters and also over all the height-of-land country to the southeast, and the Saulteux River head waters. This locality is right on the Klondyke trail, so that no trail building is needed. It will serve as the end of the northern rangers' patrol. A small cabin should be built here, so that the ranger could stay overnight. Good feed for horses is found half a mile below the summit.

These four lookouts are of the first importance. Small towers should be built, say, thirty to forty feet high. Below these should be cabins where rangers can stay overnight. In all cases good feed for horses is obtainable within a couple of miles of the lookout.

When the reserves are established and organization is begun, other lookout points should be made available. These four are, however, strategically placed and will be a good beginning for an efficient patrol. In connection with these, telephone lines should be constructed as soon as possible to connect them with the nearest settlements and points where aid can be obtained.

One of the first changes to be made when the reserves are created is to require the rangers to live on the reserves. In this way, their home life and outside interests are correlated with their work, and greater efficiency and enthusiasm results.

APPENDIX 1.

GENERAL TIMBER STATEMENT

District	Pulpwood.	Timber.	Timber.
	Cords.		Ft. B.M.
Meane Lake	4,820,000	16,000	4,820,000
Lesser Slave River Valley	0,000	0,000	2,500,000
Martin Mountain	14,200,000	227,000	12,700,000
The Narrows	734,000	0,000	1,720,000
Otanwan	100,000	2,000	53,000,000
North Slopes	2,502,000	0,000	207,722,000
Swan Hills	5,700,000	1,000,000	10,000,000
Upper Maultens	1,000,000	0,000	56,150,000
Vernihon Creek	0,000	0,000	0,000,000
Counta River	522,000	2,250,000	0,000,000
	31,021,000	4,000,000	318,612,000

APPENDIX 2.

LODGEPOLE PINE.

Lodgepole pine in its natural habitat is a valuable tree. Seed from the mountains has been tried for planting purpose in the prairie provinces, but with indifferent success because climatic and site conditions are so different from those prevailing in its range.

In the Lesser Slave region, however, lodgepole pine is found growing under climatic and site conditions which are more eastern than western.

On lower elevations the lodgepole pine is confined to the borders of swamps and wet places, or to heavy soils. On light, dry soils the jack pine drives it out, but no doubt if planted here it would do well. On the whole, the lodgepole pine is a better timber than the jack pine, which it exceeds in cleanness, height and diameter-growth. Seed gathered from thrifty lodgepole pine growing on lower elevations in the Lesser Slave Lake country would, in all probability, prove much hardier and more successful for planting on the prairies than seed gathered in the mountains. This is an experiment worth trying on some of the prairie reserves.

APPENDIX 3.

VOLUME TABLE

Diameter Breast high.	White Spruce.		Tamarack. ¹	Jack Pine. ²	Larch. ³	Aspen.
In.	Ft. B.M. ⁴		Ft. B.M. ⁴	Ft. B.M. ⁴	Ft. B.M. ⁴	Cub. Ft.
6	50	25	20	15	50	5.3
7	55	35	20	20	60	6.7
8	65	40	30	30	70	8.3
9	75	50	45	40	80	10.7
10	85	65	70	60	90	14.2
11	95	80	85	80	100	18.5
12	115	100	100	110	110	22.5
13	135	120	120	140	135	27.2
14	160	140	135	155	165	
15	200	165	155	165		
16	260	185	170	175		
17	340	230	190	185		
18	400	260	210	195		
19	460	315	230			
20	510	400	245			
21	550	500	255			
22	575	500				
23	595	520				
24	610	550				
25	625	570				
26	630	580				
27	640	590				
28	645	605				

¹ South shore of Lesser Slave Lake.² North shore of Lesser Slave Lake.³ Slave Lake.⁴ Athabaska River.⁵ Decimal "C" Scribner rule.⁶ Swan Hills, best sites (young timber).⁷ North shore of Lesser⁸ Volume used length

APPENDIX 4.

MODEL ACRE AND YIELD TABLE.

The Model Acre has been constructed from data obtained in spruce stands, site 1, near Nine-mile Point, Lesser Slave lake. Average age, height and volume are from stem-analyses of about twenty-five trees; the number of trees per acre column has been compiled from results of strip surveys covering about twenty acres. From this table the average tree is found to be 13.4 inches.

From these data a rough yield-table has been constructed, more for the purpose of showing the conditions of growth of spruce in this district than for any special value as an accurate statement of yield. The decimation rate is only approximate. It was obtained by using a curve of reduction in the number of trees per acre in the model acre as a basis for younger ages.

For older ages, the top of the curve had to be rounded off, inasmuch as decimation of trees after arriving at merchantable size is much slower than for younger stands. The decimation factor for stands over eighty years was, therefore, obtained from this interpolated curve.

Yield statements, especially for younger age-classes, are high. This is, however, borne out by actual conditions. This table, in general, bears out the statement made that no better locality for growing white spruce can be found in Canada than the south shore of Lesser Slave Lake.

MODEL ACRE WHITE SPRUCE

Diameter Breast high.	Average Age.	Average Height.	Trees per Acre.	Average Volume.	Total Volume
In.	Yrs.	Ft.		Ft. B.M.	Ft. B.M.
8	50	75	18.8	65	1,222
9	63	78	18.4	75	1,380
10	68	80	17.9	85	1,521
11	72	84	17.4	95	1,583
12	75	87	16.4	115	1,880
13	81	88	15.0	135	2,025
14	85	89	13.0	160	2,080
15	90	91	10.2	200	2,040
16	96	92	7.2	200	1,872
17	101	93	4.6	300	1,564
18	111	96	2.8	400	1,120
19	114	98	2.0	400	920
20	118	100	1.4	510	714
21	122	102	1.0	550	550
22	127	105	0.6	575	345
23	133	106	0.5	595	298
24	140	108	0.4	610	244
25	147	110	0.2	625	124
26	154	111	0.1	630	63
147.9					21,351

YIELD TABLE WHITE SPRUCE

Age.	Average Diameter Breast high.	Average Height.	Volume.	Number trees per Acre.	Yield per Acre.	Yield corrected by Curve.
Yrs.	In.	Ft.	Ft. B.M.		Ft. B.M.	Ft. B.M.
60	8.0	82	65	197	12,805	12,800
70	10.5	84	90	176	15,840	15,800
80	12.9	87	130	157	20,410	19,900
90	14.9	90	195	130	25,350	25,200
100	16.8	93	320	114	36,480	36,500
110	18.9	97	450	103	46,350	46,300
120	20.6	101	535	100	51,500	51,500
130	22.3	105	580	97	56,290	56,300
140	24.0	108	610	95	57,950	58,000
150	25.4	110	625	94	58,750	58,800

APPENDIX 5.

TABLE OF AGE OF SPRUCE SEEDLINGS.

Height.	Age (years).	Height.	Age (years).
0' 1"	4	1' 7"	6
5	4	8	6
6	4	9	6
7	4	10	7
8	5	11	7
9	5	2' 0"	7
10	5	1	8
11	5	2	8
1' 0"	5	3	9
1	5	4	9
2	5	5	9
3	5	6	10
4	5	7	10
5	6		
6	6		

APPENDIX 6.

THERMOMETER.

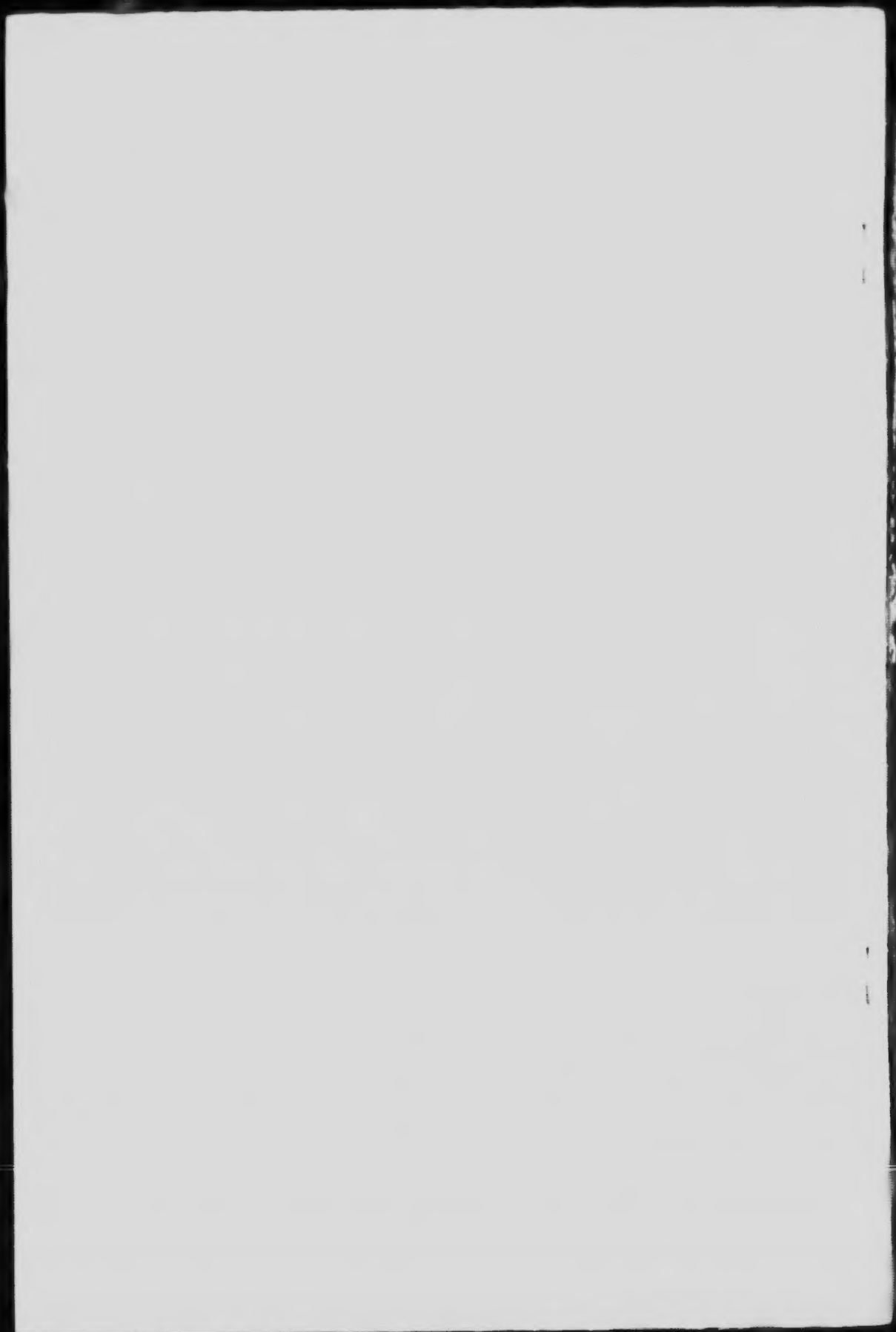
Month.	Extreme Maximum.	Average Maximum.	Extreme Minimum.	Average Minimum.	Days of Frost.
June 3-30 inclusive.....	87	72	35	44	0
July.....	85	73	29	40	3
August.....	86	70	26	30	7
September 1-24 inclusive.....	78	67	23	34	11

APPENDIX 7.

BAROMETER.

Month.	Average.	Extreme Maximum.	Extreme Minimum.
June 3-30 inclusive.....	27.10	27.85	26.64
July.....	27.12	27.66	26.73
August.....	27.16	27.54	26.78
September 1-24 inclusive.....	27.11	27.51	26.61





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 " 22. Forest Products of Canada, 1910: Cross-ties.
 " 23. Forest Products of Canada, 1910: Timber Used in Mining Operations.
 " 24. Wood-using Industries of Canada, 1910: Agricultural Implements and Vehicles, Furniture and Cars and Veneer.
 " 25. Forest Products of Canada, 1910: Lumber, Square Timber, Lath and Shingles.
 " 26. Forest Products of Canada, 1910: Pulpwood.
 " 27. Forest Products of Canada, 1910: Cooperage.
 " 28. Forest Products of Canada, 1910 (Bulletins 21, 22, 23, 24, 25, 26 and 27).
 " 29. Timber Conditions in the Lesser Slave Lake Region.

* The supply of these Bulletins are exhausted. Copies of all the others may be obtained on application to the Director of Forestry, Ottawa.